Advanced set top terminal of cable TV sending system

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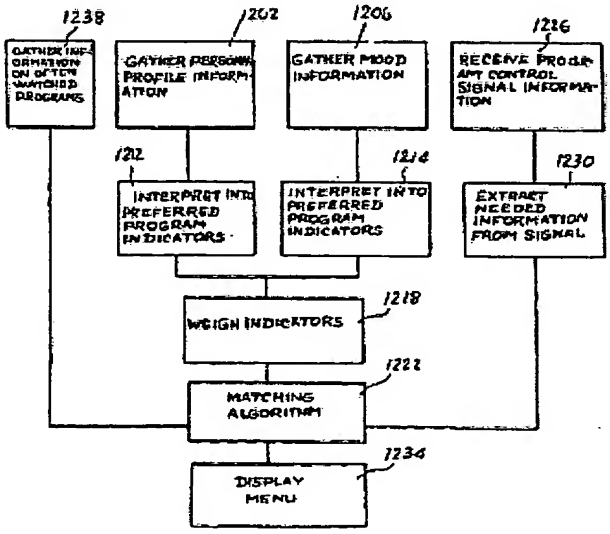
Abstract of corresponding document: **WO9414284**

A novel reprogrammable set top terminal (220) for a television program delivery system (200) which suggests programs for viewing is described. The invention relates to methods and apparatus for reprogramming set top terminals (220), and selecting and displaying programs to suggest to subscribers for viewing. The invention is particularly useful in television program delivery systems (200) with hundreds of channels of programming, a menu driven program selection system, and a program control information signal which carries data and identifies the available program choices. Specifically, the invention relates to remote reprogramming of terminal memory and the gathering



and analysis of data for selecting programs to suggest to a subscriber. The invention is a terminal which includes a means for receiving incoming signals, a processor (602), memory, and a means to generate menu screens for display on a TV or monitor. Various data gathering and analysis techniques are used to customize selection of programs for display on a menu.

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Advànced set top terminal of cable TV sending system

Description of corresponding document: **WO9414284**

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REPROGRAMMABLETERMINAL FOR SUGGESTING PROGRAMS OFFERED ON A TELEVISION PROGRAM DELIVERY SYSTEM

RELATED APPLICATIONS

This application is a continuation-in-part of application Serial Number 07/991,074 filed December 9, 1992 entitled TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM WITH MENU DRIVEN SUBSCRIBER ACCESS. The following other continuation-in-part applications, also based on the above-referenced patent application, are incorporated herein by reference: Ser. No.08/160,280,PCT/US93/11616, entitled NETWORK CONTROLLER FOR CABLE TELEVISION DELIVERY SYSTEMS, filed December 2, 1993; Ser. No.08/160,282,PCT/US93/11617, entitled AN OPERATIONS CENTER FOR A TELEVISION PROGRAM PACKAGING AND DELIVERY SYSTEM, filed December 2, 1993; Ser. No.08/160,193.PCT/US93/11618, entitled SET-TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, filed December 2, 1993; Ser. No.08/160.194.PCT/US93/11606, entitled ADVANCED SET-TOP TERMINAL FOR CABLE TELEVISION DELIVERY SYSTEMS, filed December 2, 1993; Ser. No.08/160,283,PCT/US93/11615, entitled DIGITAL CABLE HEADEND FOR CABLE TELEVISION DELIVERY SYSTEM, filed December 2, 1993

BACKGROUND OF THE INVENTION

The invention relates to television entertainment systems for providing television programming to consumer homes. More particularly, the invention relates to a user friendly system for providing consumers with television programming choices.

Advances in television entertainment have been primarily driven by breakthroughs in technology. In 1939, advances on Vladmir Zworykin's picture tube provided the stimulus for NBC to begin its first regular broadcasts. In

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1975, advances in satellite technology provided consumers with increased programming to homes.

Many of these technology breakthroughs have produced inconvenient systems for consumers. One example is the ubiquitous three remote control home, having a separate and unique remote control for the TV, cable box and VCR. More recently, technology has provided cable users in certain parts of the country with 100 channels of programming. This increased program capacity is beyond the ability of many consumers to use effectively. No method of managing the program choices has been provided to consumers.

Consumers are demanding that future advances in television entertainment

particularly programs and program choices, be presented to the consumer in a user friendly manner. Consumer preferences, instead of technological breakthroughs, will drive the television entertainment market for at least the next 20 years. As computer vendors have experienced a switch from marketing new technology in computer hardware to marketing better useability, interfaces and service, the television entertainment industry will also experience a switch from new technology driving the market to consumer useability driving the market.

Consumers want products incorporating new technology that are useful, and will no longer purchase new technology for the sake of novelty or status. Technological advances in sophisticated hardware are beginning to surpass the capability of the average consumer to use the new technology. Careful engineering must be done to make entertainment products incorporating new technology useful and desired by consumers.

In order for new television entertainment products to be successful, the products must satisfy consumer demands.

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TV consumers wish to go from limited viewing choices to a variety of choices, from no control of programming to complete control. Consumers wish to advance from cumbersome and inconvenient television to easy and convenient television and keep costs down. Consumers do not wish to pay for one hundred channels when due to lack of programming information, they seldom, if ever, watch programming on many of these channels.

The concepts of interactive television, high definition television and 300 channel cable systems in consumer homes will not sell if they are not packaged, delivered and presented in a useable fashion to consumers. The problem is that TV programming is not being presented to consumers in a user friendly manner.

Consumers are already being bombarded with programming options, numerous "free" cable channels. subscription cable channels and pay-per-view choices. Any further increase in TV entertainment choices, without a user friendly presentation and approach, will likely bewilder viewers with a mind-numbing array of choices.

What is needed is an economical system which can present television programs through a user friendly interface which allows the consumer to easily select from among the many program choices.

What is needed is a system that assists the consumer with his program selection.

What is needed is a reprogrammable system for presenting program choices.

What is needed is a system which can be remotely reprogrammed.

What is needed is a system capable of handling hundreds of programs in different formats. be expandable fo·

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future types of programming and be inexpensive. The present invention is addressed to fulfill these needs.

SUMMARY OF INVENTION

This invention is a reprogammable terminal for television program delivery systems which is capable of suggesting programs for viewing. Specifically, the present invention may be remotely reprogrammed and is capable of assisting a subscriber in selecting television programs by suggesting programs for viewing. This is a particularly useful invention for television program delivery systems with hundreds of channels of programming and a menu driven program selection system.

Preferably the terminal is located at the television set top and is used with a television delivery system that includes a program control information signal which carries data and identifies the available program choices. The terminal includes means for receiving incoming signals, a processor, memory and means to generate menu screens for display on a TV or monitor.

The terminal can be remotely reprogrammed using an incoming signal. Preferably a software interrupt followed by a memory location or software line number is transmitted via an incoming signal. This is followed by the new software programming which is written into memory at the set top terminal. Using this method, basic programming as well as menu formats, templates, logos, colors etc. may be changed.

The terminal of the present invention can also help a subscriber in selecting programs by suggesting programs to the subscriber. The terminal suggests programs that the subscriber is most likely to watch. The terminal is capable of applying several methods of analysis and a variety of

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informational sources to solve the problem of choosing a program that the subscriber is most likely to watch. For example, responsive and "intelligent" methods of analysis may be used with mood, personal profile, and historical program watched and network watched data.

Responsive methods of analysis require a subscriber to respond to a variety of questions or select subjective adjectives from program driven menus. The terminal will pose the questions or lists of subjective entries using menus and the subscriber will respond using a user interface, usually an alpha-numeric remote control. For example, subscriber preferences in mood, type of program, category/genre, actor, year preference and standard rating can be selected from menus as search entries. These entries, or key words which correlate to the entries, will be used to search a program database consisting of abstracts of a multitude of programs.

The search results in a list of programs which can be displayed to the user.

Intelligent methods "learn" the subscribers viewing choices through analysis of historical data generally gathered by the terminal in a passive mode

Through a series of analysis and weighing algorithms, the terminal is able to suggest groups of programs. A menu display of the suggested programs is offered to the subscriber.

Within the suggested group of programs, the terminal can also prioritize the programs and determine each programs menu position.

It is an object of the invention to provide a user friendly interface for subscribers to access television programs.

It is an object of this invention to assist viewers in choosing programs.

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It is an object of this invention to allow subscribers to select a program from among hundreds of choices without a television viewing guide.

It is an object of this invention to suggest program selections to viewers.

It is an object of this invention to monitor subscriber viewing choices.

It is an object of this invention to provide a system which can be reprogrammed.

It is an object of this invention to provide a system which can be remotely reprogrammed.

It is an object of this invention to provide a system which can handle many television programs and menu selection of programs.

These and other objects and advantages of the invention will become obvious to those skilled in the art upon review of the following description, the attached drawings and appended claims.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a diagram of the primary components of the television delivery system.

Figure 2 is an overview of the television delivery system operations.

Figure 3 is a schematic of the operation of the primary components of the system.

Figure 4 is a block diagram of the hardware components of the set top terminal.

Figure 5a is a perspective front view of a set top terminal.

Figure 5b is a perspective rear view of a set top terminal.

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Figure 6 is a schematic of a Turbo card upgrade for a set top terminal.

Figure 7a is a drawing of a frame format for a program control information signal.

Figure 7b is a drawing of a frame format for a polling response from the set top terminal.

Figure 8 is a drawing of the basic menus used in the present invention, including ten major menus represented by icons.

Figure 9a is a drawing of storage for on-screen menu templates and other graphics files stored in graphics memory of the set top terminal.

Figure 9b is a drawing showing the hierarchical storage of text in memory for the set top terminal.

Figure 9c is a drawing of a flow chart showing the steps required for the microprocessor to retrieve, combine and display a menu.

Figure 10a and lOb are schematics of memory structures for reprogramming the set top terminal.

Figure 11a is a drawing of the main menu used for suggesting programs based on viewer responses.

Figures 11b.lie.lid andlie are drawings of submenus used for suggesting programs based on user responses.

Figures 12a and 12b are drawings of a broadcast television menu and submenu.

Figures 12c, 12d and 12e are drawings of mood question menus.

Figure 13a is a drawing of a method for selecting programs for display.

Figure 13b is a drawing of a more detailed method for selecting programs for display.

Figure 14 is a drawing of a movie ordering/preview menu.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A Television Program Delivery System Description

1. Introduction

Figure 1 shows the present invention as part of an expanded cable television program delivery system 200 that dramatically increases programming capacity using compressed transmission of television program signals.

Developments in digital bandwidth compression technology now allow much greater throughput of television program signals over existing or slightly modified transmission media.

The program delivery system 200 shown provides subscribers with a user friendly interface to operate and exploit a six-fold or more increase in current program delivery capability.

Subscribers are able to access an expanded television program package and view selected programs through a menu-driven access scheme that allows each subscriber to select individual programs by sequencing a series of menus.

The menus are sequenced by the subscriber using simple alpha-numeric and iconic character access or moving a cursor or highlight bar on the TV screen to access desired programs by simply pressing a single button, rather than recalling from memory and pressing the actual two or more digit numeric number assigned to a selection. Thus, with the press of a single button, the subscriber can advance from one menu to the next. In this fashion, the subscriber can sequence the menus and select a program from any given menu. The programs are grouped by category so that similar program offerings are found on the same menu.

2. Major System Components

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In its most basic form, the system uses a program delivery system 200 in conjunction with a conventional concatenated cable television system 210. The program delivery system 200 generally includes (i) at least one operations center 202, where program packaging and control information are created and then assembled in the form of digital data, (ii) a digital compression system, where the digital data is compressed,combined/multiplexed, encoded, and mapped into digital signals for satellite transmission to the cable headend 208, and (iii) a set of in-home decompressors. The program delivery system 200 transports the digital signals to the cable headend 208 where the signals are transmitted through a concatenated cable television system 210. Within the cable headend 208. the received signals may be decoded, demultiplexed, managed by a local central distribution and switching mechanism, combined and then transmitted to the set top terminal 220 located in each subscriber's home over the cable system 210. Although concatenated cable systems 210 are the most prevalent transmission media to the home, telephone lines, cellular networks, fiberoptics, Personal Communication Networks and similar technology for transmitting to the home can be used interchangeably with this program delivery system 200.

The delivery system 200 has a reception region 207 with an in-home decompression capability. This capability is performed by a decompressor housed within a set top terminal 220 in each subscriber's home. The decompressor remains transparent from the subscriber's point of view and allows any of the compressed signals to be demultiplexed and individually extracted from the composite data stream and then individually decompressed upon selection by the subscriber. The decompressed video signals are converted

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into analog signals for television display. Such analog signals include NTSC formatted signals for use by a standard television. Control signals are likewise extracted and decompressed and then either executed immediately or placed in local storage such as a RAM. Multiple sets of decompression hardware may be used to decompress video and control signals. The set top terminal 220 may then overlay or combine different signals to form the desired display on the subscriber's television. Graphics on video or picture-on-picture are examples of such a display.

Although a single digital compression standard (e.g., MPEG) may be used for both the program delivery system 200 and the concatenated cable system 210, the compression technique used may differ between the two systems. When the compression standards differ between the two media, the signals received by the cable headend 208 must be decompressed before transmission from the headend 208 to the set top terminals 220. Subsequently, the cable headend 208 must recompress and transmit the signals to the set top terminal 220, which would then decompress the signals using a specific decompression algorithm.

The video signals and program control signals received by the set top terminal 220 correspond to specific television programs and menu selections that each subscriber may access through a subscriber interface. The subscriber interface is a device with buttons located on the set top terminal 220 or on a portable remote control 900. In the preferred system embodiment, the subscriber interface is a combined alpha-character, numeric and iconic remote control device 900, which provides direct or menu-driven program access. The preferred subscriber interface also contains cursor movement and go buttons as well as alpha,

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numeric and iconic buttons. This subscriber interface and menu arrangement enables the subscriber to sequence through menus by choosing from among several menu options that are displayed on the television screen. In addition, a user may bypass several menu screens and immediately choose a program by selecting the appropriate alphacharacter, numeric or iconic combinations on the subscriber interface. In the preferred embodiment, the set top terminal 220 generates the menus that are displayed on the television by creating arrays of particular menu templates, and the set top terminal 220 displays a specific menu or submenu option for each available video signal.

3. Operations Center and Digital Compression System

The operations center 202 performs two primary services, packaging television programs and generating the program control information signal. At the operations center 202, television programs are received from external program sources in both analog and digital form. Figure 2 shows an embodiment of the operations center receiving signals from various external sources 212. Examples of the external program sources are sporting events, children's programs, specialty channels, news or any other program source that can provide audio or visual signals. Once the programs are received from the external program sources, the operations center 202 digitizes (and preferably compresses) any program signals received in analog form. The operations center 202 may also maintain an internal storage of programs

The internally stored programs may be in analog or digital form and stored on permanent or volatile memory sources. including magnetic tape or RAM. Subsequent to receiving programming, the operations center 202 packages the

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programs into the groups and categories which provide the optimal marketing of the programs to subscribers. For example, the operations center 202 may package the same programs into different categories and menus for weekday, prime-time viewing and Saturday afternoon viewing. Also, the operations center 202 packages the television programs in a manner that enables both the various menus to easily represent the programs and the subscribers to easily access the programs through the menus.

The packaging of the digital signals is typically performed at the operations center 202 by computer assisted packaging equipment (CAP). The CAP system normally includes at least one computer monitor, keyboard, mouse, and standard video editing equipment. A programmer packages the signals by entering certain information into the CAP. This information includes the date, time slot, and program category of the various programs. The programmer and the CAP utilize demographic data and ratings in performing the packaging tasks. After the programmer selects the various programs from a pool of available programs and inputs the requisite information, the programmer, with assistance from the CAP, can select the price and allocate transponder space for the various programs. After the process is complete, the CAP displays draft menus or program schedules that correspond to the entries of the programmer. The CAP may also graphically display allocation of transponder space. The programmer may edit the menus and transponder allocation several times until satisfied with the programming schedule. During the editing, the programmer may direct the exact location of any program name on a menu with simple commands to the CAP.

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The packaging process also accounts for any groupings by satellite transponder which are necessary. The operations center 202 may send different groups of programs to different cable headends 208 and/or set top terminals 220.

One way the operations center 202 may accomplish this task is to send different program packages to each transponder. Each transponder, or set of transponders, then relays a specific program package to specific cable headends 208 and/or set top terminals 220. The allocation of transponder space is an important task performed by the operations center 202.

The operations center 202 may also "insert" directions for filling local available program time in the packaged signal to enable local cable and television companies to fill the program time with local advertising and/or local programming. Consequently, the local cable headends 208 are not constrained to show only programs transmitted from the operations center 202. New set top converters will incorporate both digital and analog channels. Therefore, the cable headend 207 may

combine analog signals with the digital signals prior to transmitting the program signals to the set top terminals 220.

After the CAP packages the programs, it creates a program control information signal to be delivered with the program package to the cable headend 208 and/or set top terminal 220. The program control information signal contains a description of the contents of the program package, commands to be sent to the cable headend 208 and/or set top terminal 220, and other information relevant to the signal transmission.

In addition to packaging the signal, the operations center 202 employs digital compression techniques to

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increase existing satellite transponder capacity by at least a 4:1 ratio, resulting in a four-fold increase in program delivery capability. A number of digital compression algorithms currently exist which can achieve the resultant increase in capacity and improved signal quality desired for the system.

The algorithms generally use one or more of three basic digital compression techniques: (1) within-frame (intraframe) compression, (2) frame-to-frame (interframe) compression, and (3) within carrier compression. Specifically, in the preferred embodiment, the MPEG 2 compression method is used. After digital compression, the signals are combined (multiplexed) and encoded. The combined signal is subsequently transmitted to various uplink sites 204.

There may be a single uplink site 204 or multiple uplink sites (represented by 204', shown in phantom in Figure 1) for each operation center 202. The uplink sites 204 may either be located in the same geographical place or may be located remotely from the operations center 202.

Once the composite signal is transmitted to the uplink sites 204, the signal may be multiplexed with other signals, modulated, upconverted and amplified for transmission over satellite. Multiple cable headends 208 may receive such transmissions.

In addition to multiple uplinks, the delivery system 200 may also contain multiple operations centers. The preferred method for using multiple operations centers is to designate one of the operations centers as a master operations center and to designate the remaining operations centers as slave operations centers. In this configuration, the master operations center coordinates various functions among the slave operations centers such as synchronization of

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simultaneous transmissions and distributes the operations workload efficiently.

4. Cable Headend

After the operations center 202 has compressed and encoded the program signals and transmitted the signals to the satellite, the cable headend 208 receives and further processes the signals before they are relayed to each set top terminal 220.

Each cable headend site is generally equipped with multiple satellite receiver dishes. Each dish is capable of handling multiple transponder signals from a single satellite and sometimes from multiple satellites.

As an intermediary between the set top terminals 220 and the operations center 202 (or other remote site), the cable headend 208 performs two primary functions. First, the cable headend 208 acts as a distribution center, or signal processor, by relaying the program signal to the set top terminal 220 in each subscriber's home. In addition, the cable headend 208 acts as a network controller 214 by receiving information from each set top terminal 220 and passing such information on to an information gathering site such as the operations center 202.

Figure 3 shows an embodiment where the cable headend 208 and the subscriber's home are linked by certain communications media 216. In this particular embodiment, analog signals, digitally compressed signals, other digital signals and up-stream/interactivity signals are sent and received over the media 216. The cable headend 208 provides such signaling capabilities in its dual roles as a signal processor 209 and network controller 214.

As a signal processor 209, the cable headend 208 prepares the program signals that are received by the cable headend 208 for transmission to each set top terminal 220.

In the preferred system, the signal processor 209 re-routes or demultiplexes and recombines the signals and digital information received from the operations center 202 and allocates different portions of the signal to different frequency ranges. Cable headends 208 which offer different subscribers different program offerings may allocate the program signals from the operations center 202 in various manners to accommodate different viewers. The signal processor 209 may also incorporate local programming and/or local advertisements into the program signal and forward the revised signal to the set top terminals 220. To accommodate this local programming availability, the signal processor 209 must combine the local signal in digital or analog form with the operations center program signals. If the local cable system uses a compression standard that is different than the one used by the operations center 202, the signal processor 209 must also decompress and recompress incoming signals so they may be properly formatted for transmission to the set top terminals 220. This process becomes less important as standards develop (i.e., MPEG 2).

In addition, the signal processor 209 performs any necessary signal decryption and/or encryption.

As a network controller 214, the cable headend 208 performs the system control functions for the system. The primary function of the network controller 214 is to manage the configuration of the set top terminals 220 and process signals received from the set top terminals 220. In the preferred embodiment, the network controller 214 monitors among other things, automatic poll-back responses from the set top terminals 220 remotely located at each subscribers' home. The polling and

automatic report-back cycle occurs frequently enough to allow the network

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controller 214 to maintain accurate account and billing information as well as monitor authorized channel access. In the simplest embodiment, information to be sent to the network controller 214 will be stored in RAM within each subscriber's set top terminal 220 and will be retrieved only upon polling by the network controller 214. Retrieval may, for example, occur on a daily, weekly or monthly basis. The network controller 214 allows the system to maintain complete information on all programs watched using a particular set top terminal 220.

The network controller 214 is also able to respond to the immediate needs of a set top terminal 220 by modifying a program control information signal received from the operations center 202. Therefore, the network controller 214 enables the delivery system to adapt to the specific requirements of individual set top terminals 220 when the requirements cannot be provided to the operations center 202 in advance. In other words, the network controller 214 is able to perform "on the fly programming" changes. With this capability, the network controller 214 can handle sophisticated local programming needs such as, for example, interactive television services, split screen video, and selection of different foreign languages for the same video. In addition, the network controller 214 controls and monitors all compressors and decompressors in the system.

The delivery system 200 and digital compression of the preferred embodiment provides a one-way path from the operations center 202 to the cable headend 208. Status and billing information is sent from the set top terminal 220 to the network controller 214 at the cable headend 208 and not directly to the operations center 202. Thus, program monitoring and selection control will take place only at the

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cable headend 208 by the local cable company and its decentralized network controllers 214 (i.e., decentralized relative to the operations center 202, which is central to the program delivery system 200). The local cable company will in turn be in communication with the operations center 202 or a regional control center (not shown) which accumulates return data from the set top terminal 220 for statistical or billing purposes. In alternative system embodiments, the operations center 202 and the statistical and billing sites are collocated. Further, telephone lines with modems are used to transfer information from the set top terminal 220 to the statistical and billing sites.

5. Set Top Terminal

The set top terminal 220 is the portion of the delivery system 200 that resides in the home of a subscriber. The set top terminal 220 is usually located above or below the subscriber's' television, but it may be placed anywhere in or near the subscriber's home as long as it is within the range of the subscriber's remote control device 900. In some aspects, the set top terminal 220 may resemble converter boxes already used by many cable systems. For instance, each set top terminal 220 may include a variety of error detection, decryption, and coding techniques such as anti-taping encoding. However, it will become apparent from the discussion below that the set top terminal 220 is able to perform many functions that an ordinary

converter box cannot perform.

The set top terminal 220 has a plurality of input and output ports to enable it to communicate with other local and remote devices. The set top terminal 220 has an input port that receives information from the cable headend 208. In addition, the unit has at least two output ports which provide

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communications from the set top terminal 220 to a television and a VCR. Certain menu selections may cause the set top terminal 220 to send control signals directly to the VCR to automatically program or operate the VCR. Also, the set top terminal 220 contains a phone jack which can be used for maintenance, trouble shooting, reprogramming and additional customer features. The set top terminal 220 may also contain stereo/audio output terminals and a satellite dish input port.

Functionally, the set top terminal 220 is the last component in the delivery system chain. The set top terminal 220 receives compressed program and control signals from the cable headend 208 (or, in some cases, directly from the operations center 202). After the set top terminal 220 receives the individually compressed program and control signals, the signals are demultiplexed, decompressed, converted to analog signals (if necessary) and either placed in local storage (from which the menu template may be created), executed immediately, or sent directly to the television screen.

After processing certain signals received from the cable headend 208, the set top terminal 220 is able to store menu templates for creating menus that are displayed on a subscriber's television by using an array of menu templates.

Before a menu can be constructed, menu templates must be created and sent to the set top terminal 220 for storage. A microprocessor uses the control signals received from the operations center 202 or cable head end 208 to generate the menu templates for storage. Each menu template may be stored in volatile memory in the set top terminal 220. When the set top terminal receives template information it demultiplexes the program control signals received from the

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cable headend 208 into four primary parts: video, graphics, program logic and text. Each menu template represents a different portion of a whole menu, such as a menu background, television logo, cursor highlight overlay, or other miscellaneous components needed to build a menu. The menu templates may be deleted or altered using control signals received from the operations center 202 or cable headend 208.

Once the menu templates have been stored in memory, the set top terminal 220 can generate the appropriate menus.

In the preferred embodiment, the basic menu format information is stored in memory located within the set top terminal 220 so that the microprocessor may locally access the information from the set top terminal instead of from an incoming signal. The microprocessor next generates the appropriate menus from

the menu templates and the other menu information stored in memory. The set top terminal 220 then displays specific menus on the subscriber's television screen that correspond to the inputs the subscriber selects.

If the subscriber selects a specific program from a menu, the set top terminal 220 determines on which channel the program is being shown, demultiplexes and extracts the single channel transmitted from the cable headend 208. The set top terminal 220 then decompresses the channel and, if necessary, converts the program signal to an analog NTSC signal to enable the subscriber to view the selected program.

The set top terminal 220 can be equipped to decompress more than one program signal, but this would unnecessarily add to the cost of the unit since a subscriber will generally only view one program at a time. However, two or three decompressors may be desirable to provide picture-on-

picture capability, control signal decompression, enhanced channel switching or like features.

In addition to menu information, the set top terminal 220 may also store text transmitted from the cable headend 208 or the operations center 202. The text may inform the subscriber about upcoming events, billing and account status, new subscriptions, or other relevant information. The text will be stored in an appropriate memory location depending on the frequency and the duration of the use of the textual message.

Also, optional upgrades are available to enhance the performance of a subscriber's set top terminal 220. These upgrades may consist of a cartridge or computer card (not shown) that is inserted into an expansion slot in the set top terminal 220 or may consist of a feature offered by the cable headend 208 or operations center 202 to which the user may subscribe. Available upgrades may include on line data base services, interactive multi-media services, access to digital radio channels, and other services.

In the simplest embodiment, available converter boxes such as those manufactured by General Instruments or Scientific Atlanta, may be modified and upgraded to perform the functions of a set top terminal 220. The preferred upgrade is a circuit card with a microprocessor which is electronically connected to or inserted into the converter box.

6. Remote Control Device

The primary conduit for communication between the subscriber and the set top terminal 220 is through the subscriber interface, preferably a remote control device 900.

Through this interface, the subscriber may select desired programming through the system's menu-driven scheme or

by directly accessing a specific channel by entering the actual channel number. Using the interface, the subscriber can navigate through a series of informative program selection menus. By using menu-driven, iconic or alpha-character access, the subscriber can access desired programs by simply pressing a single button rather than recalling from memory and pressing the actual channel number to make a selection.

The subscriber can access regular broadcast and basic cable television stations by using either the numeric keys on the remote control 900 (pressing the corresponding channel number), or one of the menu icon selection options.

In addition to enabling the subscriber to easily interact with the cable system 200, the physical characteristics of the subscriber interface 900 should also add to the user friendliness of the system. The remote control 900 should easily fit in the palm of the user's hand. The buttons of the preferred remote control 900 contain pictorial symbols that are easily identifiable by the subscriber. Also, buttons that perform similar functions may be color coordinated and consist of distinguishing textures to increase the user friendliness of the system.

7. Menu-Driven Program Selection

The menu-driven scheme provides the subscriber with one-step access to all major menus, ranging from hit movies to sport specials to specialty programs. From any of the major menus, the subscriber can in turn access submenus and minor menus by cursor or alpha-character access.

There are two different types of menus utilized by the preferred embodiment, the Program Selection menus and the During Program menus. The first series of menus.

Program Selection menus, consists of an Introductory, a Home, Major menus, and Submenus. The second series of

menus, During Program menus, consists of two primary types, Hidden menus and the Program Overlay menus.

Immediately after the subscriber turns on the set top terminal 220, the Introductory menu welcomes the subscriber to the system. The Introductory menu may display important announcements from the local cable franchise. advertisements from the cable provider, or other types of messages. In addition, the Introductory menu can inform the subscriber if the cable headend 208 has sent a personal message to the subscriber's particular set top terminal 220.

After the Introductory menu has been displayed the subscriber may advance to the next level of menus, namely the Home menu. In the preferred embodiment, after a certain period of time, the cable system will advance the subscriber by default to the Home menu. From the Home menu, the subscriber is able to access all of the programming options. The subscriber may either select a program directly by entering the appropriate channel number from the remote control 900, or the subscriber may sequence through incremental levels of menu options starting from the Home menu. The Home menu lists categories that correspond to the first level

of menus called Major menus.

If the subscriber chooses to sequence through subsequent menus, the subscriber will be forwarded to the Major menu that corresponds to the chosen category from the Home menu. The Major menus further refine a subscriber's search and help guide the subscriber to the selection of his choice.

From the Major menus, the subscriber may access several submenus. From each submenu, the subscriber may access other submenus until the subscriber finds a desired television program. Similar to the Major menu, each

successive level of Submenus further refines the subscriber's search. The system also enables the subscriber to skip certain menus or submenus and directly access a specific menu or television program by entering the appropriate commands on the remote control 900.

The During program menus (including Hidden Menus and Program Overlay Menus) are displayed by the set top terminal 220 only after the subscriber has selected a television program. In order to avoid disturbing the subscriber, the set top terminal 220 does not display the Hidden Menus until the subscriber selects the appropriate option to display a Hidden Menu. The Hidden Menus contain options that are relevant to the program selected by the viewer. For example, a Hidden Menu may contain options that enable a subscriber to enter an interactive mode or escape from the selected program.

Program Overlay Menus are similar to Hidden Menus because they occur during a program and are related to the program being viewed. However, the Program Overlay Menus are displayed concurrently with the program selected by the subscriber. Most Program Overlay Menus are small enough on the screen to allow the subscriber to continue viewing the selected program comfortably.

B. Detailed Set Top Terminal Description
The set top terminal 220 receives and manipulates signals from the cable headend 208. The set top terminal 220 is equipped with local computer memory and the capability of interpreting the digitally compressed signal to produce menus for the subscriber. The remote control 900 communicates the subscriber's selections to the set top terminal 220. The subscriber's selections are generally based

upon menus or other prompts displayed on the television screen.

It is preferred that the signal reaches the subscriber's home in a compressed format and is decompressed prior to viewing. Included in the delivered program signal is information that enables equipment at the subscriber's home to display menus for choosing particular programs.

Depending on the particular embodiment, the television program signal may arrive at the subscriber's home through one or more connections such as coaxial cables, fiber cables, twisted pairs, cellular telephone connections, or personal

communications network (PCN) hookups.

The program control information signal is generated by the operations center 202 and provides the network controller 214 with data on the scheduling and description of programs. In an alternate configuration, this data is sent directly to the set top terminal 220 for display to the subscriber. In the preferred embodiment, the program control information signal is stored and modified by the network controller 214 and sent to the set top terminal 220 in the form of a set top terminal control information stream (STTCIS). The set top terminal 220 integrates either the program control information signal or the STTCIS with data stored in the memory of the set top terminal 220 to generate on-screen menus that assist the subscriber in choosing programs for display.

The types of information that can be sent using the program control signal include: number of program categories, names of program categories, what channels are assigned to a specific category (such as specialty channels), names of channels, names of programs on each channel, program start times, length of programs, description of

programs, menu assignment for each program, pricing. whether there is a sample video clip for advertisement for the program, and any other program, menu or product information.

With a minimal amount of information being communicated to the set top terminal 220 on a regular basis, the set top terminal 220 is able to determine the proper menu location for each program and the proper time and channel to activate for the subscriber after a menu selection.

The program control information signal and STTCIS can be formatted in a variety of ways and the on-screen menus can be produced using many different methods. For instance, if the program control information signal carries no menu format information, the menu format for creating the menus can be fixed in ROM at the set top terminal 220. In the preferred embodiment, the menu format information is stored at the set top terminal 220 in a temporary memory device such as a RAM or EPROM. New menu format information is sent via the program control information signal or the STTCIS to the set top terminals 200 whenever a change to a menu format is desired.

In the simplest embodiment, the menu formats remain fixed and only the text changes. In this way the program control information signal can be limited to primarily text and a text generator can be employed in the set top terminal 220. Another simple embodiment uses a separate channel full-time (large bandwidth) just for the menu information.

Live video signals may be used in windows of certain menus. These video signals can be transmitted using the program control information signal or STTCIS, or can be taken off channels being transmitted simultaneously with the menu display. Video for menus, promos or demos may be

sent to the set top terminal 220 in several formats, including (1) on a dedicated channel, (2) on a regular program channel and scaled to size, or (3) along with the program control information signal. However, in the preferred embodiment, a large number of short promos or demo video is sent using a split screen technique on a dedicated channel. A multiple window technique may be used with the menus to display a description of a program and one or more video frames that assist the subscriber in selecting the program.

Figure 4 shows the basic hardware components of the set top terminal 220. The set top terminal 220 has a tuner 603, digital demodulator 606, decryptor 600, and demultiplexers 609, 616 as well as audio equipment 612 and a remote control interface 626 for receiving and processing signals from the remote control unit 900. An optional modem 627 allows communication between a microprocessor 602 and the cable headend 208. An NTSC encoder 625 provides a standardNTSC video output.

The microprocessor 602 is capable of executing program instructions stored in memory. These instructions allow a user to access various menus by making selections on the remote control 900.

The manner in which the video is decompressed and the menus are generated from the program control information signal or STTCIS varies depending on the specific embodiment of the invention. Video decompressors 618 and 622 may be used if the video is compressed. The program control information signal may be demultiplexed into its component parts, and a video decompressor 618, graphic decompressor, text generator and video combiner 624 may be used to assist in creating the menus.

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In addition to the menu format information that is stored in graphics memory, the set top terminal 220 also stores data tracking those programs that have been selected for viewing. By gathering this data, the set top terminal 220 can maintain an accurate record of all programs accessed/watched by storing the data in EEPROM or RAM. Subsequently, this data can be transmitted to the cable headend 208, where it can be used in carrying out network control and monitoring functions. Such data transmissions between the set top terminal 220 and cable headend 208 can be accomplished, for example, through upstream transmission over the cable network or over telephone lines through the use of telephone modems. Where upstream transmission over the cable network is used, the set top terminals 220 can complete data transmissions on a scheduled (e.g., using a polling response or status report to respond to polling requests sent from the cable headend 208) or as-needed (e.g., using a random access technique) basis.

Figure 5a shows the front panel of the set top terminal 220, which includes an infrared sensor 630 and a series of LED displays 640. The LED displays 640 may indicate with an icon or a letter (e. g. A-K) the major menu currently selected by the set top terminal 220 or the channels selected directly by a user, or menu channel selections (e.g., from 1 to 50). Further displays may include current channel, time, volume level, sleep time, parental lock (security), account balance, use of a

hardware upgrade, second channel being recorded by VCR, use of the Level D music hardware upgrade in a separate room, and any other displays useful to a subscriber to indicate the current status of the set top

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terminal 220. The LEDs 640 may also provide an indication of the digital audio channel currently tuned.

The set top terminal 220 includes a flapped opening 635 on its front that allows the insertion of a magnetic cartridge (or similar portable storage device, including optical disk, ROM, EPROM, etc. not shown). This cartridge opening 635 allows the set top terminal 220 to be upgraded or reprogrammed locally with the use of a magnetic tape cartridge.

On the top or cover of the set top terminal 220 are located pushbutton controls 645. Any function that can be performed on the remote 900 may also be performed at the set top terminal 220 using the duplicative pushbutton controls 645.

Figure 5b shows the back of the set top terminal 220, which includes a pair of output terminals 650, pair of input terminals 652, pair of stereo/audio output terminals 654, satellite dish input port 656, telephone jack 658 and an RS- 422 port 660. In addition, an upgrade port 662 and a cover plate 664 are held in place by a series of sheet metal screws.

One of the output terminals 650 is for a television and the other is for a VCR. The set top terminal 220 is equipped to handle incoming signals on one or two cables using the input terminals 652. The phone jack 658 and an RS-232 or RS- 422 port 660 are provided for maintenance, trouble shooting, reprogramming and additional customer features. In alternate embodiments, the telephone jack 658 may be used as the primary mode of communication between the cable headend 208 and the set top terminal 220. This connection is possible through the local telephone, cellular telephone or a personal communications network (PCN).

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The basic programming of each set top terminal 220 is located on ROM within the set top terminal 220. Random access memory, the magnetic cartridge capability, and the expansion card slot 635 each allow upgrades and changes to be easily made to the set top terminal 220.

In the preferred embodiment, the set top terminal 220 includes a hardware upgrade port 662, in addition to expansion card slots. The hardware upgrade port 662 accommodates a four-wire (or more) connection for: (1) error corrected, decrypted data output of the set top terminal 220, (2) a control interface, (3) decompressed video output, and (4) a video input port. In the preferred embodiment, multiple wires are used to perform each of the four functions. The four sets of wires are combined in a single cable with a single multipin connector.

In the preferred embodiment, multipin connections may be used for the multiwire

cable. The multipin connection 662 may range from DB9 to DB25. A variety of small computer systems interface (SCSI) ports may also be provided. Alternatively, four or more ports may be provided instead of the single port depicted.

Another port 662 is used to attach the various hardware upgrades described below to a set top terminal 220. The preferred embodiment has a number of hardware upgrades available for use with a set top terminal 220, including: (1) a Level A interactive unit, (2) a Level B interactive unit, (3) a Level C interactive unit with compact disc capability, (4) a Level D digital radio tuner for separate room use, and (5) a Level E information download unit. Each of these upgrades may be connected to the set top terminal 220 unit through the upgrade port 662 described earlier. The same four wires in a single cable described earlier may be used.

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Existing set top converter boxes such as those made by Scientific Atlanta or General Instruments are presently unequipped to handle the menu selection system of the present invention. Thus, hardware modifications are necessary in order to use the menu selection system with existing set top converter technology.

A Turbo Card addition to a set top converter is depicted in Figure 6. The Turbo Card 700 shown provides the additional functionality needed to utilize the menu system with existing set top converter technology. The primary functions the Turbo Card 700 adds to the set top converter are the interpreting of program control information signals, generating of menus, sequencing of menus, and, ultimately, the ability of the viewer to select a channel through the menu system without entering any channel identifying information.

The turbo card also provides a method for a remote location. such as the cable headend 208, to receive information on programs watched and control the operation of the set top converter and Turbo Card 700. The programs watched information and control commands may be passed from the cable headend 208 to the Turbo Card 700 using telephone lines.

The primary components of the Turbo Card 700 are a PC chip CPU 702, a VGA graphic controller 704, a video combiner 706, logic circuitry 708,NTSC encoder 710, a receiver 712, demodulator 714, and a dialer 716. The Turbo Card 700 operates by receiving the program control information signal from the cable headend 208 through the coaxial cable. The logic circuitry 708 of the Turbo Card 700 receives data, infrared commands, and synchronization signals from the set top converter. Menu selections made by the viewer on the remote control 900 are received by the set

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top converter's IR equipment and passed through to the Turbo Card 700. The Turbo Card 700 interprets the IR signal and determines the program (or menu) the viewer has selected. The Turbo Card 700 modifies the IR command to send the program selection information to the set top converter 221. The modified IR command contains the channel information needed by the set top converter. Using the phone

line and dialer 716, the Turbo Card 700 is able to transmit program access information to the cable headend 208.

In the preferred embodiment, program access information is stored at each set top terminal 220 until it is polled by the network controller 214 using a polling request message format as shown in Figure 7a. This frame format 920 consists of six fields, namely: (1) a leading flag 922 at the beginning of the message, (2) an address field 924, (3) a subscriber region designation 926, (4) a set top terminal identifier 928 that includes a polling command/response (or P/F) bit 930, (5) an information field 932, and (6) a trailing flag 934 at the end of the message. Figure 7b shows a response frame format 920' (similar to the frame format 920 end, therefore, commonly numbered with the frame depicted in Figure 7a, but with the prime indicator added for clarity) for information communicated by the set top terminal 220 to the network controller 214 in response to the polling request of Figure 7a.

The eight-bit flag sequence 922 that appears at the beginning and end of a frame is used to establish and maintain synchronization. Such a sequence typically consists of a "01111110" bit-stream. The address field 924 designates a 4-bit address for a given set top terminal 220.

The subscriber region designation 926 is a 4-bit field that

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indicates the geographical region in which the subscriber's set top terminal 220 is housed. The set top terminal identifier 928 is a 16-bit field that uniquely identifies each set top terminal 220 with a 15-bit designation followed by an appended P/F bit 930. Although field size is provided by this example, a variety of sizes can be used with the present invention.

The P/F bit 930 is used to command a polling response from the set top terminal 220 addressed, as described below.

The response frame format 920' also provides a variablelength information field 932' for other data transmissions, such as information on system updates. The frame format 920' ends with an 8-bit flag (or trailing flag) 934' that is identical in format to the leading flag 922', as set forth above.

Other frame formats (e.g.. MPEG) will be apparent to one skilled in the art and can be easily adapted for use with the system.

As summarized above, images or programs may be selected for display by sequencing through a series of menus.

Figure 8 is an example of one possible structure for a series of menus. Generally, the sequence of menus is structured with an introductory menu, a home menu, various major menus and a multitude of submenus. The submenus can include promo menus and during program menus. For example, at the home menu portion of the sequence of menus and corresponding software routines, a subscriber may select one of the major menus and start a sequence of menu displays.

Alternatively, a subscriber may go directly to a major menu by depressing a menu

select button on remote control 900.

At any time during the menu sequence, the subscriber may depress a major menu button to move into another series

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of menus. In this way, a subscriber may move from major menu to major menu.

The various software subroutines executed by the microprocessor 602 allow a subscriber to sequence the menus, navigating through the various menus of the present invention. A subscriber may sequence back through menus or return to the home menu with a single touch of the home menu button on remote 900.

An introductory menu screen 1000 automatically appears upon power-up and initialization of the set top terminal 220. From this introductory menu screen 1000, the set top terminal software will normally advance the subscriber to the home menu screen 1010. The home menu 1010 is the basic menu that the subscriber will return to in order to make the first level of viewing decisions. When the set top terminal software is displaying the home menu 1010, the subscriber is able to access any television programming option. The software allows programming options to be entered through cursor movement on the screen and directly by button selection on the remote control 900.

In the normal progression through the menu screens, the software will forward the subscriber to a major menu screen 1020 in response to the subscriber's remote control 900 selection or highlighted cursor selection from the home menu screen 1010. The selections displayed on the home menu 1010 are for large categories of programming options.

Following the major menu 1020, the subscriber may navigate through one or more submenu screens 1050 from which the subscriber may choose one particular program for viewing. For most programming selections, the user will proceed from the home menu 1010 to a major menu 1020 and then to one or more submenus 1050. However, for

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certain programming options or functions of the set top terminal 220, the user may skip one or more menus in the sequence.

The During Program Menus 1200 are submenus enabled by the set top terminal software only after the subscriber has selected a television program. These menus provide the subscriber with additional functionality and/or additional information while viewing a selected program. The During Program Menus 1200 sequence can be further subdivided into at least two types of menus, Hidden Menus 1380 and Program Overlay Menus 1390.

To avoid disturbing a subscriber during viewing of a program, the Hidden Menus 1380 are not shown to the subscriber but instead "reside" at the set top terminal 220 microprocessor 602. The microprocessor 602 awaits a button entry either from the remote control 900 or set top terminal 220 buttons before executing or displaying

any Hidden Menu 1380 options. The set top terminal software provides the subscriber with additional functions such as entering an interactive mode or escaping from a selected program through use of Hidden Menus 1380.

Program Overlay Menus 1390 are similar to Hidden Menus 1380. However, the Program Overlay Menus 1390 are overlayed onto portions of the displayed video and not hidden. The software for the Program Overlay Menus 1390 allows the subscriber to continue to watch the selected television program with audio but places graphical information on a portion of the television screen. Most Program Overlay Menus 1390 are graphically generated to cover small portions of video. Some Overlays 1390 which are by their nature more important than the program being viewed will overlay onto greater portions of the video.

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Examples of types of overlay menus 1390 include Notification Menus 1392 and Confirmation Menus 1394. In the preferred embodiment, the software for the Program Overlay Menus 1390 controls the reduction or scales down the (entire) programs video and redirects the video to a portion of the screen.

Submenus provide the cost of viewing the program and the program's length in hours and minutes. From the submenus, the subscriber is given at least three options: (1) to purchase a program, (2) to return to the previous menu, and (3) to press "go" and return to regular TV. The subscriber may also be given other options such as previewing the program.

Using an on-screen menu approach to program selection, there is nearly an unlimited number of menus that can be shown to the subscriber. The memory capability of the set top terminal 220 and the quantity of information that is sent using the program control information signal are the only limits on the number of menus and amount of information that can be displayed to the subscriber. The approach of using a series of menus in a simple tree sequence is both easy for the subscriber to use and simply implemented by the set top terminal 220 and remote control device 900 with cursor movement. A user interface software programmer will find many obvious variations from the preferred embodiment described.

The set top terminal 220 generates and creates menus using, in part, information stored in its graphics memory. A background graphics file 800 will store menu backgrounds and a logo graphics file will store any necessary logos. A menu display and cursor graphics file will store menu display blocks and cursor highlight overlays as well as any other

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miscellaneous files needed to build the menus. Using this method of storing menus, the menus can be changed by reprogramming the graphics memory of the set top terminal 220 through instructions from either the network controller 214 or operations center 202.

The microprocessor 602 performs the steps required to create a menu using stored information. The microprocessor 602 fetches a background file, logo file, menu display and cursor file in most instances. The microprocessor 602 fetches text from

long-term, intermediateterm, or short-term storage depending on where the text is stored. Using a video combiner (or like device), the stored information is combined with video and the entire image is sent to the television screen for display.

In the preferred embodiment, a graphics controller is used to assist the set top terminal 220 in generating menus.

Menu generation by the set top terminal 220 begins with the building of a major menu screen, which includes background graphics for that major menu. The background graphics may include an upper sash across the top of the screen and a lower sash across the bottom of the screen. The background graphics may be generated from the background graphics file 800 in the memory files of the graphics memory (preferably EEPROM). In addition, logo graphics may be generated.

Such graphics typically include an icon window, a cable company logo, a channel company logo, and two "go" buttons.

Preferably, the text for each major menu is generated separately by a text generator in the set top terminal 220.

Those portions of the text that generally remain the same for a period of weeks or months may be stored in EEPROM or other local storage. Text which changes on a regular basis, such as the movie titles (or other program selections), is

transmitted to the set top terminal 220 by either the operations center 202 or the network controller 214 of the cable headend 208. In this manner, the cable headend 208 may change the program selections available on any major menu 1020 by modifying the program control information signal sent by the operations center 202 and transmitting any changes using the STTCIS.

Day, date and time information are added to each major menu. This information is sent from the operations center 202, the cable headend 208 (signal processor 209 or network controller 214), the uplink site, or generated by the set top terminal 220 internally.

The creation and display of program description submenus is performed by the set top terminal 220 in a manner similar to that described above. Each submenu may be created in parts and combined before being sent to the television screen. Preferably, background graphics and upper and lower sashes are used. Likewise, a video window and half-strip window can be generated from information in storage on the EEPROM.

In addition to graphics and text, some submenus include windows that show video. Such video may be still or moving pictures. Still pictures may be stored in a compressed format (such as JPEG) at the set top terminal 220. Video stills may be transmitted by the operations center 202 through the program control information signal from time to time.

Moving video picture is obtained directly from a current video feed as described

above. Depending on video window size, this may require manipulation of the video signal, including scaling down the size of the video and redirecting the video to the portion of the menu screen

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which is within the video window of the menu. Alternatively, the video may be obtained from a split screen channel. Such a method involves the use of split screen video techniques to send multiple video clips on a single channel at a given time. The set top terminal 220 would scale the picture, if necessary, and redirect it to the correct position on the screen using known scaling and positioning techniques. Additional circuitry may be required in the set top terminal 220 to perform adequate scaling and repositioning.

To avoid the need for redirecting video into the portion of the screen which houses the video window, masking and menu graphics may be used to cover the portions of the channel video that are not needed. This masking technique allows the split screen video to remain in the same portion of the screen that it is transmitted by the operations center 202. The masking is then adjusted to cover the undesired portions of the screen. These masks are stored in the background graphics file similarly to other background files for menus.

The split screen video technique may also be used for promoting television programming. Since a great number of short video clips may be sent continuously, full or partial screen promotionals (or informationals) may be provided to the subscriber. With this large quantity of promotional video, the subscriber is given the opportunity to "graze" through new movie or television programming selections. The subscriber simply grazes from promotional video to promotional video until the desired television program is discovered.

C Program Control Information Signal
Throughout the present application, the term "program control information" is being used to indicate

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control information coming from the cable head end 208 to the set top terminal 220, whether it is sent directly from the Operations Center 202, processed by the network controller 214 and then forwarded to the set top box, or transmitted over telephone lines.

The program control information signal generated by the Operations Center 202 provides data on the scheduling and description of programs to the network controller 214 or, in an alternate configuration, directly to the set top terminal 220 for display to the subscriber. In the preferred embodiment, the program control information signal is stored and modified by the network controller 214 and sent to the set top terminal 220 in the form of a set top terminal control information stream (STTCIS). This configuration is required to accommodate differences in individual cable systems and possible differences in set top terminal devices.

The set top terminal 220 integrates either the program control information signal or the set top terminal control information stream together with data stored in the

memory of the set top terminal 220, to generate on-screen displays for assisting the subscriber in choosing programs.

The goal of the menu driven program selection system 200 is to allow the subscriber to choose a program by touring through a series of menus, organized generally as depicted in Figure 8. utilizing the remote control 900 for cursor movement. The final choice in the series of menus will identify one particular channel and one time for activation of that channel. Armed with a channel and activation time the set top terminal 220 can display the selected program on the television for the viewer. To achieve this goal a simple embodiment assigns an intelligent alpha-numeric code to each program. This alpha-numeric code identifies the

category of the program, the menu in which the program should be displayed, its transmission time(s), and the position on the menu that the program should be displayed.

In this simple embodiment, the program control information, including menu codes, is sent continuously from the Operations Center 202 to the network controller 214. and ultimately to the set top terminal 220. For example, four hours worth of programming information can be sent via the program control information signal continuously as shown in Table A.

Table A shows the basic programming information that may be sent to the set top terminal 220. The program descriptions shown are coded abbreviations. For example, C for comedy. N for news, S for sports, A for cartoons, and Tx for text. If there is a textual description for a program, such as a movie, the description may be given following that program's coded description or may be communicated following the four hours' worth of programming information.

As is shown in the coded listing, program descriptions for programs greater than a half hour in length need not be repeated (each half hour). The video description code informs the set top terminal 220 of whether there is still or live video available to advertise the program.

For example, a sporting program may be assigned a code of B35-010194-1600-3.25-Michigan St. vs. USC. The letter B would assign the program to category B, sports. The second alpha-numeric character number 3 would assign the program to the third menu of the sports category. The third character of the code, number 5, assigns the program to the fifth program slot on the third menu. The next six characters.01/01/94, represent the date. The following four characters, 1600 represent the start time which is followed

by the length of the program and the program name. This entry represents a sports show, a college football game, which will be aired at 4:OOPM on New Years day 1994.

TABLE A 12 PM

EMI42.1

<tb>
<tb> *Program <SEP> name <SEP> -Program <SEP> *Menu <SEP> code <SEP> *Description
<tb> Cheers <SEP> E24
<tb> Terminator <SEP> 2.0 <SEP> A33
<tb> 3 <SEP> PrimeTime <SEP> 1.0 <SEP> D14
<tb> FootballB24
<tb> Special
<tb>
12:30 PM
EMI42.2

<tb>
<tb> name <SEP> *Program <SEP> length <SEP> *Menu <SEP> code <SEP> 'Description <SEP> *Video <SEP> - <SEP>
<tb> 1 <SEP> Simpsons <SEP> .5 <SEP> E14 <SEP> & <SEP> C13 <SEP> C <SEP> S
<tb> 4 <SEP> Football <SEP> Game <SEP> 3.0 <SEP> B13 <SEP> S <SEP> N
<tb>

In the 12:30 Channel 1 entry of Table A, two menu codes are shown. By allowing two menu codes, programs that may fit under two different category descriptions may be shown in both menus to the subscriber. With this minimal amount of information being communicated to the set top terminal 220 on a regular basis, the terminal is able to determine the proper menu location for each program and the proper time and channel to activate for the subscriber after his menu selection.

Table B shows an example Events Table that may be downloaded to a set top terminal 220 using the Event. Dat file which contains information about events and pricing. As shown in the table, the three columns of the Events Table identify the field number, the field itself and the type of information downloaded in the Event. Dat file. The first column contains the field numbers 1 through 11. The middle

column contains the corresponding field parameters, including the event type, event ID, global channel ID, price, start time, end time, start date, end date, P- icon. name and description. The third column contains corresponding field type information. Field type information typically consists of an unsigned integer; hours, minutes and seconds; months, day and year; and ASCII character identifier.

TABLE B
EMI43.1

<tb>
<tb> Field <SEP> Field <SEP> Type <SEP>
<tb> 1 <SEP> Event <SEP> Type <SEP> Unsigned <SEP> Int
<tb> 1 <SEP> = <SEP> YCTV <SEP>
<tb> 2 <SEP> = <SEP> Pay-Per-View
<tb> 1 <SEP> = <SEP> Reg <SEP> T

<tb> 2 <SEP> Event <SEP> ID <SEP> Unsigned <SEP> Int
<tb> 3 <SEP> Global <SEP> Channel <SEP> ID <SEP> Unsigned <SEP> Int
<tb> 4 <SEP> Price <SEP> (in <SEP> Cents) <SEP> Unsigned <SEP> Int
<tb> 5 <SEP> Start <SEP> Time <SEP> HH:MM:SS
<tb> 6 <SEP> End <SEP> Time <SEP> HH:MM:SS <SEP>
<tb> 7 <SEP> Start <SEP> Date <SEP> MM/DD/YY <SEP>
<tb> 8 <SEP> End <SEP> Date <SEP> MM/DD/YY <SEP>
<tb> 9 <SEP> P-Icon <SEP> ASCIIZ <SEP>
<tb> 10 <SEP> Name <SEP> ASCIIZ
<tb> 11 <SEP> Description <SEP> ASCIIZ
<tb>

Table C shows an example Event. Dat data file. In particular, Table C shows two data streams corresponding to two event types. The first data stream identifies aYCTVTM event in the first field. The second field designates the event ID, which is 1234 in this example. The third field includes the global channel ID number two. The fourth field indicates the cost of 50 cents for this event. The fifth and sixth fields indicate the respective start and end times of 3: 00 AM to 3: 00 PM, respectively. The seventh and eighth fields show the corresponding start and end dates, designated as 8/25/93 and 8/27/93, respectively. Field nine indicates the P-icon set to PBS. PCX graphics file. Finally, fields ten and

eleven indicate the name and description of the events selected, which in this case are Sesame StreetTm andBarneyTM. The second data stream in the Event.Dat example shown in Table C includes analogous information for Terminator IVTM. which is designated in field one as a payper-view event.

TABLE C Event.Dat Example
EMI44.1

<tb>
<tb> 1' 1234'2'50'03:00:00'15:00:00'08/25/93'08/27/93'pbs.pcx'Sesame <SEP> Street
<tb> Barney's <SEP> Sesame <SEP> Street <SEP> and <SEP> Barney <SEP> Abstract
<tb> 2' 1234'2'50'20: <SEP> 00:00'22:00:00'08/25/93'08/25/93'14.pcx'Terminator <SEP> 4 <SEP> Terminator <SEP> 4
<tb> Abstract~~~

EPROM. This configuration provides the desired flexibility in the menu format while still limiting the amount of information needed to be communicated via the program control information signal. New menu format information can be sent via the program control information signal or the STTCIS to the set top terminals 220 each time there is a change to a menu.

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Program access information for each program watched is stored at the set top terminal 220 until it is polled by the network controller 214 for information retrieval using the program control information signal or STTCIS. This information retrieval can be accomplished by using the polling request message and response formats, 920 and 920' respectively, as shown, and Figures 7a and 7b, and described above, but any suitable polling request and response message format may be used to interrogate each set top terminal 220 sequentially, one by one. The set top terminals 220 are identified by a unique address and set top terminal identifier.

It is preferred that the set top terminal 220 transmit information and messages to the network controller 214 only when given permission by the network controller 214 to do so.

Where, for example, specialty programs have been accessed since the previous poll, the set top terminal 220 is given permission to transmit a polling response 920' in the form of a status report that includes any such access information. The network controller's control receiver (not shown) is tasked with the receipt of set top terminal polling responses or status reports. These status reports generally include information that allows the network controller 214 to track a subscriber's program access history.

Figure 7b shows an example of frame format 920' for the status reports received from the set top terminals 220 during the polling cycle. This frame format is identical to the polling request message format 920 and, as described, includes: (1) a leading flag 922' at the beginning of the message. (2) an address field 924', (3) a subscriber region designation 926'. (4) a set top terminal identifier 928'

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that includes a polling command/response (or P/F) bit 930', (5) an information field 932', and (6) a trailing flag 934' at the end of the message.

The information field 932' remains variable in length so that the status of an indeterminate number of programs, represented at 931. accessed can be included in the frame.

In this way, the control message length of the polling request message is minimal since the network controller 214 does not transmit such access information. After a polling response by a given set top terminal 220, however, the control message length increases in proportion to the number of programs accessed.

During transmission the P/F bit is used to carry out the polling function. In

particular, the P/F bit is set to a "1" position to command a polling response from the set top terminal 220 whose address is identified in the frame. The set top terminal 220 addressed must respond to the command in the same P/F bit also set to the "1" position.

The response will include the number of programs accessed and their corresponding event identification numbers as shown in Figure 7b at 931. In cases where the set top terminal 220 has not accessed any programs since the previous polling cycle, the set top terminal 220 responds with the P/F bit set to "1" and the programs access block denoting zero programs accessed.

In between polling cycles, the program control information continues to supply the set top terminals 220 with menu information. In the simplest embodiment, the menus remain fixed and only the text changes. Thus, the program control information signal can be limited to primarily text and a text generator can be employed in the set top terminal 220. This simple embodiment keeps the

cost of the set top terminal 220 low and limits the bandwidth necessary for the program control information. Another simple embodiment uses a separate channel full-time (large bandwidth) just for the menu information. This separate channel would facilitate the rapid downloading of new graphics for the system and would enhance response time when text and other data information needs to be changed.

In the preferred embodiment, the basic building blocks or templates of the on-screen menu displays will be stored in graphics memory consisting of nonvolatile RAM, FLASH ROM.

EPROM, or preferably. EEPROM, as shown as 620 in Figure 9a. Referring to Figure 4, with the information from the graphics memory 620, the microprocessor 602. graphics decompressor 622, a text generator (not shown in Figure 4, but incorporated if necessary), and video combiner 624 will build a menu screen.

The memory files of the graphics memory are preferably categorized into three categories, background graphics 800, logo graphics 820, and menu and display graphics 850, as shown in Figure 9a.

The background graphics file 800 will store menu backgrounds such as: universal main menu backgrounds 804, universal submenu backgrounds 808, promo backgrounds 812 and custom menu formats 816. The logo graphics file 820 will store any necessary logos such as: Your Choice TVTM logos 824, Network logo files 828. cable system logo files 832, studio logo files 836, and graphic elements file 840. The menu display and cursor graphics file 850 will store menu display blocks 854 and cursor highlight overlays 858. as well as any other miscellaneous files needed to build the menus.

Using this method of storing menus discussed above. the menus can be changed by reprogramming the graphics

memory 620 of the set top terminal 220. To revise the entire design of displayed menus, the network controller 214 or operations center 202 instructs the EEPROM 620 to be erased and reprogrammed with new menu templates. To change one menu format or logo, the network controller 214 or operations center 202 instructs just the one location in memory to be erased and rewritten. Obviously, this menu reprogramming can also be done locally (at the set top terminal 220) by a servicemen.

As shown in Figure 9a, each memory subfile is further divided into various memory blocks. For example, the background graphics file 800 contains the universal main menu backgrounds 804. The universal main menu backgrounds memory 804 includes memory units UM1 860, UM2 862 and UM3 863. Similarly, the logo graphics file 820 and menu display and curser graphics file 850 contain individual subfile memory blocks (for example, studio logo file 836 has memory block SL1 864: menu display blocks 854 has memory menu display block MD1 866).

Figure 9b shows the hierarchical storage of text transmitted from the cable headend 208. Although text may be continuously transmitted with the video signals to set top terminals 220. text may also be transmitted intermittently.

In such a case, the text is stored in the set top terminal 220.

Preferably, the text is transmitted and stored in a compressed format using known techniques. Additionally, the text is preferably stored in graphics memory 620 within the set top terminal 220.

Depending upon the use of the text, it will be stored in one of three portions of memory. Information sent with the text will either direct the text to a particular portion of memory, or include information as to the priority of text.

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The microprocessor 602, part of the set top terminal hardware represented at block 880, may then direct the text to the appropriate memory location for storage.

If the text is to be used frequently and over a long period of time a long term storage 875 will be used. If the text will be used for a shorter period of time (for example, a month), the text will be directed to an intermediate storage area 877. If the text is to be used almost immediately, or for a short period of time (for example, within a few days) the text is directed to a short term storage area 879. The microprocessor 602 locates the appropriate text required for a particular menu and retrieves it from the appropriate portion of memory 620. The text is output from the graphics memory 620 to the text generator 621. Text generated from the text generator 621 is thereafter directed to text/graphics video combiner 624.

Figure 9c shows the steps performed by the microprocessor 602 for creating a menu based upon a series of overlay screens. These instructions are stored in memory within the set top terminal 220 in a screens data file. The screens data file instructs the microprocessor 602 on the location of each graphics file on the screen.. An

example screens data file is shown in Table D, wherein the screens data file specifies menu data positioning in terms of, for example, x and y pixel positions, height and width, color codes and fonts. Alternatively, instructions or routines may be transmitted from the operations center 202 to be stored in memory within the individual set top terminals 220.

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TABLE D
EMI50.1

<tb>
<tb> The <SEP> following <SEP> data <SEP> lines <SEP> are <SEP> for <SEP> the <SEP> main <SEP> menu
<tb> Screen <SEP> Type <SEP> Template <SEP> File <SEP> Description <SEP>

<tb> SCREEN <SEP> '@MAIN <SEP> 'main <SEP> menu.pcx <SEP> 'Main <SEP> Menu <SEP>
<tb> - <SEP> Justify <SEP> X <SEP> Y <SEP> Ht <SEP> Wd <SEP> FColor <SEP> BColor <SEP> Font
<tb> STRPOS <SEP> 'Left <SEP> '165 <SEP> '85 <SEP> '30 <SEP> '300 <SEP> '27 <SEP> '55 <SEP> FUTUR14. <SEP> GFT
<tb> STRING'MAIN <SEP> MENU <SEP>
<tb> - <SEP> Justify <SEP> X <SEP> Y <SEP> Hght <SEP> Wdt
<tb> PCXPOS <SEP> 'LEFT <SEP> '190 <SEP> '75 <SEP> '200 <SEP> '200
<tb> PCXexamplel. <SEP> pcs
<tb> Justify <SEP> X <SEP> Y <SEP> Ht <SEP> Wd <SEP> FColor <SEP> BColor <SEP> Font <SEP> X <SEP> Y <SEP> Ht <SEP> Wd
<tb> ITEMPOS <SEP> 'Left'120 <SEP> '100 <SEP> '20 <SEP> '400 <SEP> '15 <SEP> '25 <SEP> FUTUR12.GFT <SEP> '110'90'30'420
<tb> ITEM'@YCTV'YOUR <SEP> CHOICE <SEP> TV
<tb> Justify <SEP> X <SEP> Y <SEP> Ht <SEP> Wd <SEP> FColor <SEP> BColor <SEP> Font <SEP> X <SEP> Y <SEP> Ht <SEP> Wd
<tb> ITEMPOS <SEP> 'Left'120 <SEP> '200 <SEP> '20 <SEP> '400 <SEP> '15 <SEP> '25 <SEP> FUTUR12.GFT <SEP> '110'190'30'420
<tb> ITEM <SEP> '@PPVPAY-PER-VIEWHITMOVIES
<tb>

As shown at block 878 in Figure 9c, initially the microprocessor 602 instructs the tuner 603 to select a channel. The channel is decompressed, error corrected and decrypted, if necessary. If the video is to be reduced in size, so as to be placed within a video window, or is a split screen video window which must be enlarged, the video is scaled to the appropriate size. Additionally, the video may be required to be redirected to a portion of the television screen, accomplished by creating a series of offsets for each pixel location of the video.

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Graphics must also be used to create a menu in most instances. As shown in block 882, the microprocessor 602 must fetch a background file, a logo file, and a menu display and cursor file in most instances. Each of these files is decompressed 883, and then combined, block 886.

Similarly, the microprocessor 602 must fetch text, as shown in block 884. Depending upon the memory location of the text, the microprocessor 602 will fetch the text from long-term, intermediate-term, or short-term storage, as described above. Based upon this memory retrieval, the text is generated, block 885, and combined with the video (if any), with as many screens of a decompressed graphics as are necessary, and any text, block 886. The image or portions of the image are stored in the video combiner (for example, combiner 624 of Figure 4) until all overlays are received.

Thereafter, the entire image is sent, under direction of another routine, to be displayed on the television screen, as represented by display block 888.

D. Reprogrammable Terminal forSuggesting
Programs
1. Reprogramming the Set Top Terminal
In addition to all the features that the set top terminal 220 supports with internal programming resident at the set top, additional features may be added or existing features upgraded through remote reprogramming of the set top terminal 220. In the preferred embodiment, the cable headend 208, specifically the network controller 214, performs the remote reprogramming of the set top terminal 220. The cable headend 208 is able to reprogram the memory of the set top terminal 220. With this capability the cable headend 208 can remotely upgrade most software or data stored in memory at the set top terminals 220. For

example, in the preferred embodiment, the cable headend 208 reprograms the menu format from time to time based upon special events or programming needs, such as Olympic telecasts, presidential elections, etc.

Set top terminal reprogramming preferably operates using the program control information portion of the transmitted signal and sending the appropriate data within the program control information. When reprogramming is to occur, the cable headend 208 will send an interruption sequence within the program control information format that informs the set top terminal 220 that reprogramming information is to follow. In an alternative embodiment, one channel is dedicated for the special programming needs of the set top terminal 220.

Significant reprogramming of the set top terminals 220 will occur infrequently. However, the changing of color or menu formats will occur more often. In alternative embodiments, color changes to menus may be accomplished via the program control information itself and does not require reprogramming from the cable headend 208.

Using the method of storing menus discussed above with reference to Figure 9a. the menus can be changed by reprogramming the graphics memory 620 of the set top terminal 220. There are at least two methods for reprogramming graphics memory

First, the instructions for generating the menus can be changed. These instructions are stored within the set top terminal 220 in a file (not shown in Figure 9a). The instructions provide the microprocessor with the location of each graphics file to be displayed on a menu screen (see Table D). Reprogramming the graphics file can be initiated by either sending an interrupt from the network controller 214 or attaching a 2-4

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bit code to the program control information signal or the STTCIS indicating that instructions in graphics memory are going to be changed. The signal also designates either the file name to be changed, or alternatively, the memory locations in the graphics memory to be rewritten.

The new instructions could either be sent in the information field 932 (Figure 7a) of the program control information signal or on a dedicated channel. Upon execution by the microprocessor, the new instructions will be loaded into the appropriate files. Alternatively, the new instructions could be loaded into RAM or disc and later stored in the appropriate memory locations upon execution by the microprocessor. With the new instructions stored in graphics memory, the microprocessor, graphics decompressor, text generator (depicted at 623, Figure 9b) and video combiner can build new menu screens.

Alternatively, the graphics (e.g., background graphics 800, icons, logo's 820, menu display blocks 854, cursor highlight overlays 858, etc.) can be changed directly by accessing and rewriting the files in graphics memory 620.

For example, to revise the entire design of displayed menus, the network controller 214 or operations center 202 instructs the memory to be erased and reprogrammed with new menu templates (or background graphics file). In the preferred embodiment, the menu format information of the on screen menu displays is stored at the set top terminal 220 in graphics memory 620 consisting of RAM. ROM. EPROM, or preferably EEPROM. To change menu formats, logos, icons, etc., directly, the network controller 214 or operations center 202 instructs the appropriate memory locations to be erased and rewritten with the new menu data using memory location identifiers in the instructions sent in either the

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program control information signal or STTCIS. New menu format information can be sent via the program control information signal or the STTCIS to the set top terminals 220 each time a change in menus occurs.

Obviously, this type of remote menu reprogramming can also be done locally (at the set top terminal 220) by loading an external cartridge into the set top terminal 220 containing reprogramming instructions with the graphics changes.

In addition to menu reprogramming. the software programs resident at the set top terminal may be reprogrammed. Generally, to reprogram software programs resident at the set top terminal 220, the network controller 214 sends an interruption command via the program control information signal or STTCIS (hereinafter designated "program control information signal") informing the set top terminal

220 that reprogramming information will follow.

The program control information signal also contains memory address locations or instruction lines where reprogramming will occur. Preferably, both the interrupt and memory address locations are included in the data portion of the program control information signal framework. The data portion of the program control information signal will also include the program changes.

Interpreting the reprogramming software resident at the set top terminal 220, the microprocessor 602 will instruct that the reprogramming changes be stored initially in volatile memory such as RAM. After locating the appropriate memory locations or instruction lines, the microprocessor 602 at the set top terminal 220 reads the frames of program control information received and writes

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the programming changes to the appropriate memory locations.

There are at least two alternative embodiments for implementing the reprogramming of the set top terminal 220 discussed above. The preferred embodiment is shown in Figure 10a. In this embodiment, the software with reprogramming instructions 1100 is stored in a nonvolatile storage chip (EPROM) 1102 at the set top terminal 220.

Since this program is resident in nonvolatile storage, it will be able to continue to execute after a power failure. The current executable program version n is stored on FLASH ROM in storage sectors 0 to x.

Reprogramming of the set top executable program can occur at any time. Reprogramming may commence after the sending of an interruption message via the program control information signal informing the set top that reprogramming will follow. The network controller 214 will follow the interruption message with the new program version n+1in the data portion of the program control information signal.

The microprocessor 602 recognizes and interprets the interrupt message and directs the execution of the reprogramming software 1100 stored in EPROM. The reprogramming software 1100 instructs the construction of a file in RAM 1104 to house the new program version n+1, as shown at 1106, and the microprocessor 602 will interpret the program control information signal and direct that the new program version n+ 1106 be stored in RAM 1104, as shown.

Once the new program version n+1106 is completely loaded in RAM 1104, as indicated by reception of all data packets, the process of reprogramming the FLASH ROM 1108 begins. In this embodiment, the new program version

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n+1106 will be loaded into the same FLASH ROM 1108 as the old program version n 1110. The microprocessor 602 will direct the new program version n+1 1106 to overwrite the old program version n 1110. The old program version n can be rewritten with the new program version n+1by initially rewriting all locations in

the appropriate sector of FLASH ROM 1108 to zero. This sector of memory is then erased and the sector is rewritten with the data in the new executable program version n+1 1106. This process continues sector-by-sector until the new program is completely transferred and stored in the memory locations of FLASH ROM 1108. Upon completion of loading the new program version n+1 into the FLASH ROM 1108, the set top terminal 220 will be reset. After resetting, the set top terminal 220 will commence operating off of the new executable program version n+1.

If there is a failure during the resetting process, the set top terminal 220 will have to send a message to the network controller 214 requesting that the controller resend another copy of the new program version n+1. The reprogramming process will then begin anew, as described in the preceding paragraphs.

* Alternatively, reprogramming can occur with the configuration shown in Figure lOb. The process for reprogramming in this embodiment is similar to that depicted in Figure 10a and, therefore, is commonly numbered except for different steps or features. However, a current program version n 1110 remains in FLASH ROM (i.e., is not overwritten with the new version n+1) throughout the process, wherein the new current version will overwrite an old program version n-1 1112. By not overwriting the current program version n 1110, the particular application

being changed can continue to operate in normal fashion in the event of failure. The set top terminal 220 continues to run off the program version n 1110 until the new executable program n+1106 is completely loaded in the FLASH ROM 1108
As in the embodiment described above with reference to Figure 10a, the network controller 214 sends an interrupt message via the program control information signal to signify that reprogramming will commence. The new program version n+1106 is sent from the network controller 214. or other remote location, in the data frame within the program control information signal.

The microprocessor 602 recognizes and interprets the interrupt message and directs the execution of the reprogramming software 1102. Once the reprogramming software 1102 recognizes the file name of the new program version n+1106. the software instructs the construction of a file in RAM to house the new program version n+1 1106.

The new program version n+1 1106 is then loaded into RAM 1104. Once all of the packets of the new executable version n+11106 are completely loaded in RAM 1104, the process of reprogramming the FLASH ROM 1108 begins. In particular, an instruction commands the initiation of loading the new program version into the sectors X to X plus N of the FLASH ROM 1108. Each sector of memory comprising the old program version n-1 1112 in the FLASH ROM 1108 is rewritten with the new data in the new program version n+1 1106.

If a single FLASH ROM does not have enough memory capacity to store both the current program version n 1110 and new program version, the new program version 1106 can be loaded into a second FLASH ROM.

Upon completion of loading of the new executable 1106 into FLASH ROM 1108, the microprocessor 602 will command that the set top terminal 220 be reset. Resetting the set top terminal 220 will cause the old program version n 1110 to be flushed out, causing the new executable program version n+1 1106 to run.

As an alternative to resetting the entire set top terminal program, the set top executable code can be written modularly, with a main module and a series of sub-modules.

With this code structure, the set top program would not necessarily need to be entirely reset when replacement code is provided to the set top. Instead, individual sub-modules may be selectively replaced. Only when a replacement main module is sent, is resetting of the set top program necessary.

The instructions for reprogramming (overwriting) are contained in the main module, which calls sub-modules of code. The sub-modules are not active until called by the main module. During the calling procedure, a check for the existence of replacement code (new code) for that submodule is performed. This check may be performed either by a physical check of a particular memory location, the setting of a variable in a particular memory location or other method. If replacement code is found for the called submodule, the replacement code will be run. After a series of error checks on the viability of the replacement code. instructions are sent for the replacement code to overwrite the called upon sub-module in the sub-module's memory location.

Although the embodiments describe three specific methods for accomplishing reprogramming of the set top terminal 220, those of ordinary skill in the art will recognize that the reprogramming methodology is not limited to those

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embodiments described above but can also consist of embodiments employing different types and configurations of memory devices. Those skilled in that art will also recognize that the reprogramming methodology is not dependent on receiving new programs or graphic files from the network controller 214 or operations center 202 but the new programs or graphic files could also be generated at either the set top terminal 220 or other remote locations.

2. Suggesting Programs Description a Overview
Referring to Figuresl la-e, 12a-e. 13a and 13b and 14, the terminal's ability to assist a subscriber in choosing channels or programs for viewing is presented. There are a variety of methods in which a set top terminal 220 can suggest a channel or program for viewing. These methods can be loosely categorized into three groups: (1) responsive methods, (2) intelligent methods and (3) methods which integrate both responsive and intelligent methodologies.

All of the methodologies for suggesting programs have in common the provision of gathering data that is representative of subscriber preferences. The microprocessor 6[illegible] wil. interpret. format and store this data in memory at the set top terminal 22(

Alternatively, the subscriber specific data can be stored in memory at the network controller 214. Using program scheduling and descriptive information received from the operations center 202 or network controller 214 in either the program control information signal or STTCIS, and the subscriber specific data, the set top terminal 220 can select programs suited to subscriber viewing preferences based on one of the analytical methodologies described below. These programs can be displayed on the television screen for viewer selection. Once

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the subscriber has indicated a selection by using, for example, a remote control 900 utilizing cursor movement, the microprocessor 602 at the set top terminal 220 can match the subscriber selection to the program and direct the set top terminal 220 to tune to the selected program.

With memory and a microprocessor 602 built into the set top terminal 220, "intelligent" methods of determining a subscribers programming preference are possible. By analyzing a subscribers past behavior, the set top terminal 220 can literally "learn" to suggest appropriate programming or channels for a viewer. To accomplish this analysis, clues as to the subscribers behavioral pattern must be saved in the set top terminals memory. These clues, such as programs watched and time periods of television viewing, are analyzed as necessary to develop a profile of the viewer. Most of this information is gathered and stored by the set top terminal 220 unbeknownst to the subscriber. A simple example is t h e set top terminal 220 "learning" which channels are a subscriber's favorite channels. A simple learning process would involve the set top terminal 220 determining which channels were the most often watched by the subscriber and then assuming that those channels are the subscriber's favorite channels.

More sophisticated learning algorithms can be implemented in the set top terminals 220 via expert systems, for example. These expert systems adapt to changing viewer preferences over time and change the corresponding subscriber profile.

Alternatively, a responsive method of suggesting programs or channels may be used. Using the subscriber interface and menu generation, program selections can be responsive to information gathered from inquiries about the

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particular subscriber or from subscriber selected entries descriptive of preferred programming.

Methods for suggesting programs or channels can integrate the use of the set top terminal's intelligence and information gathering potential. In order to combine the methods, "weights" are generally assigned to various indicators which assist in determining what channel or program the viewer desires. Following evaluation of the weighted information, program or channel suggestions are made to the viewer. For example, the weights attributed to different preference indicators can be accumulated and processed resulting in a selection signal which could be matched to suggested programming through the use of logic networks.

While each of the suggestive embodiments described below are set forth in

reference to a set top terminal, numerous hardware variations are possible, including using the embodiments in video rental equipment such as a kiosk. b. Responsive Embodiment Using Program Abstracts

In the preferred "responsive" embodiment (depicted in Figureslla-e), program abstracts are used to facilitate the suggestion of programs to subscribers. The abstracts are preferably created either at the network controller 214 or the operations center 202. They would be similar in text and format to those used to describe movies currently listed in common TV movie guides. Each abstract contains language descriptive of the particular program's contents. These abstracts are preferably stored in a database either at the network controller 214 or set top terminal 220.

If the program abstract database is stored locally at the set top terminal 220. it can reside in either ROM, EPROM or

on disc. If stored at the set top terminal 220, the program abstract database will preferably initially be sent from the network controller 214 or operations center 202 on the program control information signal or on a dedicated channel. In this embodiment, updates and changes to the program abstract database can be accomplished as mentioned above in the description regarding reprogramming the graphics memory.

In this embodiment, the program control information is received by the set top terminal 220 and integrated with menu details stored in graphics memory. With this integrated information, the microprocessor, graphics decompressor, text generator and video combiner will generate a main menu screen and series of submenu screens.

The microprocessor 602 directs the displaying of the menu screens to the subscriber. The menu screens, as described in more detail below, comprise a graphical display of search criteria. Each particular search criteria has a list of preference entries.

The subscriber will provide responses to the set top terminal 220 by selecting preference entries indicative of the subscriber's programming preferences. For example, the subscriber can utilize a remote control 900 to facilitate the selection of preference entries by touring through the menus with the assistance of a cursor.

Each subscriber entry will then be mapped into a set of key words selected from a downloaded thesaurus.

Alternatively, the subscriber entries could be used as the key words. The key words are then used by the microprocessor 602 to search the program abstract database. If the program abstract database is at the network controller 214, the set top terminal 220 will have to send the key words to the network

ontroller 1.. The microprocessor 602 will then select one or more program

suggest to the subscriber based on the results of the abstract search. These suggested programs will then be displayed on the menu for viewer selection.

More specifically, this embodiment can be described with reference to the menu screens in Figures 11a-11e. In this embodiment, as shown in the main menu 1130 depicted in Figure 11a, a list of possible search criteria (hereinafter criteria) 1132, including mood, type, category/genre, actor, time, year preference and standard rating, are provided to assist in the search of selected program suggestions. The viewer has the option to select as few or as many of the criteria 1132 as desired, with the understanding that the more data provided. the more selective the resulting list of suggested programs. The subscriber can select a desired criteria 1132 by depressing buttons either on a remote portable controller or on the set top terminal 220 to move a cursor or highlight bar on theTV screen.

Following selection of a criteria on the main menu, the viewer may move through one or more submenu screens from which to choose particular entries indicative of programming preferences. As mentioned above, the viewer may choose as few or as many criteria as desired. One criteria depicted in the main menu 1130 is the mood criteria 1134. Upon selection by the viewer of the mood criteria 1134, a submenu 1136 will appear on the screen, depicted in Figure llb. The mood submenu 1136 allows the viewer to pick from a list of subjective moods 1138, such as SERIOUS, THOUGHTFUL, LIGHT, TIRED, SAD, etc. Preferably the viewer will use a cursor or highlight bar to scroll down the list of subjective moods and select the preference entries desired by clicking on a select button on either the remote or on the set top

terminal 220. The viewer can select one or more of these moods with the exception that the program will not allow the selection of what it determines to be mutually exclusive moods (e.g., HAPPY and SAD). This is accomplished by locking out a mood selection when its opposite has already been chosen.

The selected moods are cross referenced (or mapped) with a list of key words from a downloadable thesaurus table stored preferably in either ROM, EPROM or on disc at the set top terminal 220. The key words will then be used to directly search the abstracts in the program abstract database (not shown).

Referring back to Figure 11a, the viewer can select the program TYPE criteria 1144 in which to further distinguish the programs by program preference. Upon selection of the TYPE criteria 1144, the TYPE submenu 1146. as shown in Figurelie. will appear on the screen. This submenu 1146 consists of a number of descriptive adjectives 1148 that will preferably be used directly as key words to search the abstracts resident in the program database. The viewer can select one or more adjectives 1148 to make the search more selective.

Again, referring back to Figure 11a, if the viewer selects the standard category/genre criteria 1152 shown in the main menu, the category/genre submenu 1154 will appear as shown in Figure11 d, allowing the viewer to qualify a search to one or more of the program categories downloaded to the database (example: MOVIE, DRAMA, CHILDREN, etc.).

Figure 11a shows that a viewer can also refine a search by selecting a favorite actor 1158. Selecting the actor criteria 1158 will allow a viewer to fill in a name entry window 1160.

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The name entry window 1160 is limited to six letters in the preferred embodiment with the cursor on the first location, and a name is entered sequentially one letter at a time. The channel up/down key, either on the remote or set top terminal 220, allows the viewer to scroll forward and backward, respectively, through the alphabet. When the desired letter has been chosen and entered, the viewer can use the volume up/down key to move left and right in the name through all the letter positions, until the actor's name has been fully or partially entered. The search tool will search for all the occurrences of the letters entered. If the name has been fully entered, a precise search of the program abstract database will be conducted for that name. If the name has been only partially entered, the search tool will look for a closest match to the partially entered name.

The TIME criteria 1162 allows a viewer to choose the preferred time of day, the preferred duration (in 30 minute increments up to 2 hours), and the preferred day of the week. An alternative embodiment would allow the viewer to select up to X hour time periods for a certain day in which to search.

The YEAR criteria 1164 preferably comprises groupings of years. For example, the current year and programs five to ten years old, ten to 20 years old, 20 to 40 years old, and older than 40 years. If desired, the viewer can highlight more than one group of years. If the viewer does not highlight any grouping of years, then all years are assumed desired by the viewer.

The STANDARD RATING criteria 1166 allows the viewer to qualify the search to one or more of the MPAA ratings (G, PG. PG-13, R, NC-17).

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In alternative embodiments, the actors, time, years, ratings, etc., can also be selected through the provision of submenus similar to those depicted in Figures 11b-11d.

The preferred embodiment also provides for "negative" searches. In this type of search, words descriptive of a program type of no interest to the viewer can either be used directly as key words or mapped into key words in the downloaded thesaurus. If the key words are found in a program during a search of the database, the program is automatically excluded from the selection list. For example, if the viewer does not desire to view any X or R rated movies, the viewer can simply choose to exclude movies rated as X or R by selecting these ratings on the main menu.

In this embodiment, after the viewer has selected as many of the entries as desired, and then hits the "go" button or alternatively selects by cursor or highlight a "go" menu item on the menu screen, the corresponding search will commence. Any

typical search tool can be used to search the program abstract database. For example, a Boolean search can be used to scan the database of textual entries and retrieve the textual entries that satisfy the Boolean search.

The programs which meet the search criteria (contain the key words corresponding to entries) selected by the viewer will be counted and the count displayed in the "No.

Selections" box 1170 in the upper right hand corner of each of the screens 1130. 1136. 1146, 1154 of Figure 11a through lid.

If the viewer desires to view a list of all of these selections and/or corresponding abstracts, the viewer may select the VIEW option 1172 in the main menu 1130. Upon selection of the view option, the microprocessor 602 instructs the selection list menu 1174, as shown in Figure

lie. to be displayed on the screen. The viewer can scroll down the list by using the cursor and select the desired movie by clicking on the desired program indicated by cursor or highlight. In Figurelie. for example, the viewer has selected the John Wayne movie GREEN BERETS. After making the selection, the program is displayed on the screen, but if there are too many or too few programs listed, or the viewer decides not to watch any of the selected programs, the viewer has the option of returning to the main menu by selecting the RETURN TO MAIN MENU box 1176.

Once the main menu screen 1130 is displayed, the viewer may choose to begin a completely new search, or alternatively, may refine the prior search. If the viewer chooses to perform a refined search, the viewer can access the various submenus and choose further preference entries resulting in a more precise search and fewer number of program selections.

It is understood that this embodiment of searching program abstract databases can be combined with the other methods described below, including viewer profile data and most often watched information. For example, different criteria can be assigned different weights (weighting the criteria's preference entries). Then based on an evaluation of the weighted preference entries, only those programs satisfying a minimum weighted index would show up as a selection to be suggested to the viewer.

Alternatively, program indicators can be generated and used in assigning a weight number to programs. The weight a program is assigned could be based on either most watched program information, favorite channel, or personal profile as described below. The list of suggested entries resulting from the program abstract search methodology described above

could then be further refined and reduced based on the results of accumulating the weighted indicators corresponding to the programs listed. For example, weighted numbers can be assigned to programs based primarily on the category of the

program. The weighted numbers are used by the system to refine the search. Those programs suggested from the program abstract search can then be prioritized and either displayed in prioritized order or further refined by deleting programs not satisfying a minimum weight threshold thereby reducing the list of suggested programs displayed to the viewer. The refined list is then displayed to the viewer. c. Other Program Suggestion Embodiments
In another "Responsive" embodiment, a favorite channel list can be established based on responses to inquiries. In this embodiment, menus can be used to query a subscriber and allow the subscriber to select eight favorite channels for later display. Figure 12a depicts a menu 1180, the Broadcast TV Menu, with a favorite channels category of program menus 1182 for selection. Figure 12b shows an example of a favorite channel program submenu 1184 being displayed. Although a variety of types of information can be requested, mood questions and inquiries on personal information about a subscriber are preferred for this responsive method of selecting programs for viewers.

In another embodiment, both favorite channels and often watched channels features can be utilized during menu selection. As described above, favorite channels can be stored in memory in the set top terminal 220 for later use. In addition to favorite channels. the broadcast TV menu 1180, has a separate often watched channels category 1186 which

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allows the subscriber or the set top terminal 220 in a learning mode to choose eight additional channels for display.

In another embodiment, in a manner similar to learning the most often watched channels of the subscriber. the terminal can also determine the most often watched programs by the subscriber. After developing (or learning) a list of popular shows or querying the subscriber for a list of popular shows the terminal can display a customized submenu allowing the subscriber to choose one of the suggested popular shows available for viewing. In order to display suggested programs that are available, the set top terminal 220 must cross reference the available programs with the viewers choices. This can be accomplished using the program control information signal. After the cross reference, a popular show submenu similar to the favorite channel submenu shown in Figure 12b may be displayed on the television or monitor.

In one embodiment, a sophisticated program viewing suggestion feature is available as an optional feature for the subscriber. This feature gives the indecisive viewer or lazy viewer specific suggestions as to which programs the viewer should watch. The set top terminal 220 uses a combination of intelligent and responsive methodologies along with a matching algorithm to accomplish the program viewing suggestion feature.

In order for the set top terminal 220 to make decisions on which programs the subscriber should watch, the terminal creates a personal profile for the particular viewer. Using the data in the particular viewer's personal profile, subscriber mood information and the television program information available in the program control information signal, the set

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top terminal 220 is able to select a group of programs which the particular viewer is most likely to watch.

Specifically, the set top terminal 220 builds a personal profile for each viewer and stores the information in a memory file by viewer name. To build a personal profile, the viewer answers a series of questions presented on a series of menu screens. These personal profile screens request the viewer to input information such as name, sex, age, place of birth, place of lower school education, employment type. level of education, amount of television program viewing per week, and the number of shows in particular categories that the viewer watches in a given week such as, sports, movies, documentaries, sitcoms, etc. A universal remote control 900 with alpha-numeric buttons may be used to assist in entering the demographic data. Any subscriber demographic information which will assist the set top terminal 220 in suggesting television programs to the viewer may be used.

This raw data must be interpreted, formatted, and stored in memory by the set top terminal 220. Preferably the gathered data is processed and stored in a relational database. Once a personal profile has been created (in a particular set top terminal 220), it can be indefinitely stored in nonvolatile memory.

Alternatively, the personal profile information may be electronically transmitted to the set top terminal 220 from a remote location such as the cable headend 208 or billing site.

In some cable systems, personal profile information is stored at the billing site. This information can be electronically transmitted via phone or cable to the set top terminal 220.

The set top terminal 220 must receive the data, interpret the data, and format the data for storage in a database in memory, as well as for later use.

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A selection at the home menu screen 1010 (Figure 8) activates the program selection feature. Following activation of the program selection feature, as shown in Figures 12c- 12e, the set top terminal 220 will present the viewer with a series of brief questions to determine the viewer's mood at that particular time. For example, the first mood question screen 1190 may ask the viewer to select whether a short (30 minute), medium (30-60 minute), or long (60 plus minute) program selection is desired, as shown in Figure 12c. The second mood question screen 1192 requests the viewer to select between a serious program, a thoughtful program, or a light program, as shown in Figure 12d. And the third mood question screen 1194 requests whether the user desires a passive program or an active program, as shown in Figure 12e. The viewer makes a selection in each question menu utilizing the cursor movement keys and "go" button on his remote control 900. A variety of other mood questions are possible such as the fatigue level of the viewer, whether the viewer is in the mood for older programming, etc.

After the viewer has responded to the mood question menus which determine the viewer's mood, the set top terminal 220 uses a matching algorithm to find the best programming matches for the viewer and displays an offering of several suggested programs to the viewer (three or more programs are preferred). The matching algorithm compares the viewer profile data, mood data, and most often watched program information (if available, or favorite program information) with information about the program derived from the program control information (or STTCIS) signal, such as show category, description type, length, etc. Using the personal profile information and mood questions suggested above, the following types of outcomes are possible.

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If the set top terminal 220 is presented with a young female viewer, educated in Boston who watches sitcoms on a regular basis, and desires a short, light, passive program, a match might be found with the 30-minute sitcom Cheers, the sitcomDesigning Women, or Murphy Brown. Taking another example, for a middle-aged male viewer from the Boston area, wishing a longer length, light, passive program, the New England PatriotsFootballTM game, the Boston Red SoxBaseballTM game or a science fiction movie might be suggested.

With this program selection feature, the set top terminal 220 can intelligently assist the specific viewer in selecting a television program from among hundreds of available choices. The viewer is preferably offered a graphic menu of suggested program choices from which to choose.

Instead of the set top terminal 220 requiring an input of personal profile information, the terminal may also "learn" the personal profile information. A subscriber's viewing habits may be "learned" by maintaining historical data on the subscriber and analyzing this data. The historical data may include the channels (or networks) and types of programs the viewer has most frequently watched, time of viewing, duration of viewing, duration of programs viewed etc. This information must then be analyzed to profile the viewer.

In the preferred "learning" embodiment, the personal profile information is time and date sensitive in that program indicators will be different depending on the date and time of day. For example, a working male with a high school education who has been active in sports or enjoys sporting events might have a heavily weighted sport program indicator during the day on the weekend days but a heavy comedy program indicator in the late evenings on weekdays. His

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profile might show light programming on working day evenings. After analysis, the indicators can be communicated to the weighing algorithm and the matching algorithm which selects the suggested television programs. The matching algorithm may be implemented through the use of a logic network. The logic network includes a signal detector which could be used for storing and accumulating the weighted indicators. Based on the accumulated weighted indicators, the logic network could provide a selection signal for use in matching to suggested

program.

Examining Figure 13a, two gathering steps are required, personal information and mood information gathering, denoted at blocks 1202. 1206, respectively. As described above, there are several methods in which this information may be gathered. Once it is gathered, it may be stored (and updated as necessary) for future use. The indicators may be newly calculated for each subscriber entry into the program selection system. Alternatively, at least each time the information gathered is changed or updated, the information must be reinterpreted and converted into preferred program indicators, blocks 1212, 1214.

Program indicators should at a minimum indicate the type of programming to be suggested. To accomplish this, television programs are divided into program categories preferably the same or similar to those categories used for the menu sequence for menu selection of programs (described in the detailed description of the set top terminal 220). For example, sports, comedy, news, documentaries, and hit movies may be program categories. Although a variety of program indicators can be used, the preferred method is to assign a weight to each program category. Thus, a database of information can be analyzed and weights can be assigned to

the program categories such as sports (40), comedy (30), news (20), documentaries (5), hit movies (5).

Using the example shown in Figure 13a, a set of preferred program indicators consisting of categories and weights are assigned based on the personal profile data. A second set of preferred program indicators are assigned based upon the mood data. These two sets of preferred program indicators would then be analyzed and weighted, block 1218, prior to entering the matching algorithm, block 1222.

In a specific example, a subscribers updated personal profile might indicate: sports (40), comedy (30), news (20), documentaries (5), hit movies (5); The subscribers mood might indicate: sports (40). comedy (20), news (5), documentaries (5). hit movies (30). The weight given to mood might be a factor of three while the weight given to personal profile might be a factor of one, since mood information is the more recent and important information.

The weighted indicators passed onto the matching algorithm would be three times the mood indicators plus one times the personal profile indicators, namely: sports (160), comedy (90), news (35). documentaries (20), hit movies (95).

Therefore, the matching algorithm will focus on sports but also provide selections in hit movies and comedy. The matching algorithm is unlikely to suggest any programs in the news or documentaries categories.

The more areas of information that are gathered and used for indicators, the more weighing factors and calculations that are necessary by the weighing algorithm.

Other more sophisticated methods of weighing the importance of the data may be used.

The matching algorithm receives program control signal information, block 1226, and extracts needed information therefrom, block 1230, then matches programs with subscribers. The matching algorithm involves three primary steps: (1) eliminating programs that are out of the subscribers desired time frame, (2) eliminating programs in program categories that the subscriber is not interested in watching, and (3) determining priority of desired programs.

Finally, the selected programs are displayed, block 1234.

The first two steps eliminate the programs in which the viewer has shown no interest. The first step eliminates programs out of time sequence (current start time or next half hour) and outside the desired length (e. g. 30-60 minutes). With two or three hundred channels in the program delivery system this would reduce the program choices by approximately two thirds to roughly 100 programs.

The next step eliminates programs in program categories that have received the lower program indicator numbers. For instance, in the example above the news and documentaries program category received low indicator numbers. Programs in these categories are eliminated. This generally reduces the number of programs by at least 40 percent from about 100 to 60 or so programs.

The next step is to assign weight numbers to each program. Weight numbers are assigned to programs based primarily on the category of the program. If programs are in two program categories (e. g. hit movie and comedy) an average is taken of the two assigned weight numbers for each program category. The weighted numbers are used by the system as the subscribers selection criteria.

Having weighted the programs, the number of relevant programs can be reduced by examination of the weighted

numbers. It is preferred that ultimately the hundreds of available television programs be reduced to the twenty or so programs most likely to be viewed by the subscriber.

A variety of methods can be used to determine the final priority of the programs. Where using certain selection methodologies, programs in the same category have the same weight, other finer methods of differentiation may be used.

For example, programs receiving the same weight can be further distinguished by network. Programs on the major networks may take priority over programs on smaller networks. Programs that are on networks that the viewer watches more frequently can be given priority over networks less frequently watched. Another example of differentiation is that newer programs (more recently filmed programs) are given priority over older programs. Finer methods of gradation may be accomplished by refining the weighted numbers assigned to the programs or through simple reprioritizing of programs on the short list of twenty programs

Following the matching, the programs may be displayed on a menu screen generated as described earlier. A signal identifying the suggested programs is generated to assist in the menu generation process. It is preferred that 4 to 8 selections are shown on a menu screen. If none of these selections are satisfactory to the viewer, then a second and third menu screen of program choices may be displayed.

Upon selection of a program the set top terminal tunes or switches the viewer to the chosen program.

In an alternative embodiment, as shown in Figure 13b (commonly numbered with Figure 13a except for block 1238). program watched information, block 1238, can be used directly in the matching algorithm. One way in which

the program watched information can be used directly by the matching algorithm is by determining and using the often watched information in the final decision step. After the matching algorithm has ordered a selection of programs for the viewer the often watched program list may be used to modify or refine thefmal program list prior to display. For example, the matching algorithm may choose 20 of 100 programs and order the programs 1 through 20 from the most likely to the least likely viewer choices. This ordered list of 20 is compared with the most often watched program list.

A simple use of the list would be to compare between the ordered list of 20 selected programs and the often watched list, to locate the matches or closely related programs and increase the order number of those programs or "bump up" those programs on the ordered list. A second method would be to increase the located programs weighted number before ordering the 20 programs according to weight. In either case, the effect is that the often watched programs are shifted to a higher priority on the list of twenty programs and ultimately may be placed on the first suggested menu screen of programs. A third method of using the information would be to locate any often watched program existing within the 100 current programs and assign each located program a high weighted value before the matching algorithm calculations described above are performed.

In an alternative embodiment, additional coded information is provided to the set top terminal 220 via the program control information signal to assist with the program selection. For example, demographic codes for each program may be sent via the program control information signal.

Additional bits could be added to the frame shown in Figure

7a to facilitate the communications of the code from the controller to the set top terminal 220. A code table could be stored in memory at the network controller 214. Each code would correspond to an attribute. In this embodiment, a program database would comprise a listing of hundreds of programs along with codes which provide descriptive attributes pertaining to the program. These attributes could be

similar to the entries already described above in the menus of figureslla-lle. The demographic codes describe the subscriber demographics most likely to match with the program. Thus, a comparison of the stored demographics in the personal profile and the demographic codes will render a list of preferred programs for the subscriber. Those skilled in the art will realize that a variety of information may be sent by code via the program control information signal.

Although the embodiments specifically describe the use of several sources of information to suggest programs to the subscriber (i.e. mood and personal profile), those skilled in the art will realize that any one source of information or many more sources may be used. Those skilled in the art will also realize that this program suggestion methodology is not limited to the specifics types of information described but can be used with various types of information that indicate a viewer preference.

Using these methodology, it is even possible for the set top terminal 220 to suggest programs for two viewers. By using two sets of viewer profile information, the matching algorithm can find the best match for joint viewing. For example, the set top terminal 220 can suggest programs for a couple watching television simultaneously. The terminal would use the data stored in memory for each of the two viewers and determine the couples program selections which

are similar or overlap. This method of program selection can resolve disputes between viewers.

After a subscriber selects a suggested program from a menu screen or list of the selection feature, the microprocessor 602 electronically informs the tuning and decompressing hardware of the bandwidth location of the appropriate program (within the television program signal).

Armed with this information the set top terminal 220 is able to display the program for the viewer on a television, monitor or similar device. Alternatively, a preview menu screen 1142 as shown in Figure 14 may be shown to the subscriber which describes and previews the program selection. The preview menu screens may include live video or stills 1144 depicting the program selected.

The terms and descriptions used herein are set forth by way of illustration only and are not meant as limitations.

Those skilled in the art will recognize that numerous variations are possible within the spirit and scope of the invention as defined in the following claims.

What is claimed is:

Data supplied from the *esp@cenet* database - Worldwide

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理查德·E·旺德里奇
埃里克·C·伯科宾

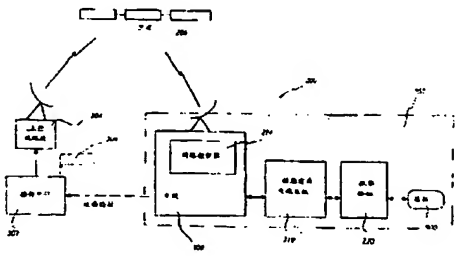
[74]专利代理机构 永新专利商标代理有限公司
代理人 韩 宏

权利要求书7页 说明书70页 附图页数32页

[54]发明名称 有线电视发送系统先进机顶终端

[57]摘要

描述了一个新颖、先进的机顶终端、它用于一个电视节目递送系统(200)中,能将数字压缩码解码、产生菜单互动和其它先进的功能特性。本发明以涉及使现有机顶终端(220)升级的方法和装置。本发明以产生一个升级的机顶终端,它支持菜单的产生、画像叠覆的显示、节目一览表服务、互动性服务、致电者辨识、数字音响接收、录像机控制、高清晰度电视接收以及后院卫星系统可配合运行性等特征和功能。



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权　利　要　求　书

1、一种用于机顶终端的遥控器，该机顶终端接收多个电视和数字节目控制信息信号，这些信号用于产生多个与其相应的菜单，每个菜单相应于一组相关的节目或一单个的节目并具有由节目控制信息信号携带的菜单内容数据，该遥控器包括：

多个开关，包括：

菜单选择开关，用于从多个菜单中选择一个想要的菜单，每个菜单选择开关具有一个表示多个菜单中的一个菜单的图标，从而通过按下带有表示想要的菜单的图标的菜单选择开关就可以直接地选择想要的菜单；和

光标移动开关，用于将光标移动到多个菜单中的一个菜单上；和

装置，耦合至所述多个开关，用于与机顶终端相通信，其中对多个开关中的一个开关的选择实现在机顶终端中对由数字节目控制信息信号携带的菜单内容数据进行处理。

2、根据权利要求 1 的遥控器，其中所述多个开关为可按压的按钮。

3、根据权利要求 1 的遥控器，其中所述菜单选择开关与光标移动开关的颜色不同。

4、根据权利要求 1 的遥控器，其中光标移动开关上具有条纹。

5、根据权利要求 1 的遥控器，其中用户凭触觉就可以容易地找到并按下一个光标移动开关或菜单选择开关并且无需看遥控器就可以将光标移动开关和菜单选择开关与多个开关中的其他开关相区别。

6、根据权利要求 1 的遥控器，其中所述多个开关包括两组开关，标准组包括音量控制和频道选择开关，以及特殊组包括光标移动开关和菜单选择开关，两组开关在遥控器上被位于遥控器重心或位于遥控器重心之上的一条线分隔开。

7、根据权利要求 1 的遥控器，还包括一个用于移动光标的操纵杆。

8、根据权利要求 1 的遥控器，还包括一个用于移动光标的球。

9、根据权利要求 1 的遥控器，还包括一个用于移动光标的滚动式可按压的按钮。

10、根据权利要求 1 的遥控器，其中每个菜单显示一组菜单选项，多个菜单被分为至少两级菜单，即第一级菜单和第二级菜单，使得第二级菜单包括与节目类别相应的节目分类菜单，其中类似的节目被集中在一起以供选择，并且其中菜单选择开关用于选择节目分类菜单中的一个，每个菜单选择开关表示一个节目分类菜单，其中按下表示所选择的节目分类菜单的菜单选择开关就可以直接访问该节目分类菜单而绕过第一级菜单。

11、根据权利要求 10 的遥控器，其中所述图标表示节目类别。

12、根据权利要求 1 的遥控器，还包括：

带有标签的面板。

13、根据权利要求 11 的遥控器，其中所述菜单选择开关从面板上突出。

14、根据权利要求 1 的遥控器，还包括：

一个启动按钮，耦合到用于通信的装置上，用于选择显示在电视上

的菜单选项，其中按压该启动按钮则实现对机顶终端处的软件进行处理，并且其中光标移动开关和启动按钮用于对所产生的任何菜单进行排序。

15、根据权利要求 1 的遥控器，其中光标移动开关为定向光标移动按钮，第一定向光标移动按钮与第二定向光标移动按钮沿遥控器的纵向相对从而形成纵向的定向按钮对，而第三定向光标移动按钮与第四定向光标移动按钮沿遥控器的横向相对从而形成横向的定向按钮对，并且其中纵向的和横向的定向按钮对是中心对称并相互垂直的。

16、根据权利要求 15 的遥控器，还包括：

一个启动按钮，耦合到用于通信的装置上，用于选择显示在电视上的菜单选项，其中按压该启动按钮则实现对机顶终端处的软件进行处理，并且其中光标移动开关和启动按钮用于对所产生的任何菜单进行排序；

其中该启动按钮位于纵向的和横向的定向按钮对之间的区域；

其中四个定向光标移动按钮中的每一个具有一个倾斜的表面并且该倾斜的表面朝着启动按钮的方向向下倾斜；以及

其中该启动按钮低于四个定向光标移动按钮的倾斜表面。

17、根据权利要求 1 的遥控器，还包括：

一个收费电视按钮。

18、根据权利要求 1 的遥控器，还包括：

一个电源按钮。

19、根据权利要求 1 的遥控器，还包括：

一个音量按钮。

20、根据权利要求 1 的遥控器，还包括：

标准频道选择按钮，包括频道升按钮、频道降按钮和编号从零至九的数字按钮。

21、根据前面任一个权利要求的遥控器，还包括：

一第一部分，包括：

至少一个音量控制按钮；和

至少一个频道选择按钮；

一第二部分，包括菜单选择开关和光标移动开关。

22、根据权利要求 21 的遥控器，其中该第二部分加上第一部分提供了一个具有音量、频道、菜单选择和光标移动功能的综合遥控器。

23、根据权利要求 21 的遥控器，其中该第一部分和第二部分是可分开的。

24、根据权利要求 1—20 中任何一个的遥控器，还包括：

机顶终端单元，包括：

用于接收数字节目控制信号的装置；

用于使用数字节目控制信号产生菜单、包括主菜单和子菜单的装置；

用于接收按钮按压信号的装置；

用于使用按钮按压信号实现程序指令的执行顺序的装置；和

用于使用程序指令和接收到的按钮按压信号顺序通过主菜单和子菜单的装置。

25、根据权利要求 24 的遥控器，还包括：

用于显示所选择的子菜单的电视。

26、根据权利要求 24 的遥控器，还包括：

一电缆端头，其中接口系统与电缆端头处的软件进行接口，该机顶终端向上游与电缆端头相通信，其中激活开关则实现对电缆端头处的软件进行处理。

27、根据权利要求 26 的遥控器，其中从电缆端头接收节目信号并且被选择用来观看的节目在接收到节目信号时被观看。

28、一种用于使用具有菜单光标和相应于节目类别的菜单选项的主菜单并使用带有光标移动按钮、菜单选择按钮和启动按钮的遥控器在电视系统上选择节目分类子菜单的方法，该方法包括步骤：

产生带有相应于节目分类菜单的菜单选项的主菜单，这些菜单选项可用菜单光标来选择；

从主菜单中选择节目分类子菜单，包括：

用遥控器上的光标移动按钮将菜单光标移动到相应于一个想要的节目分类子菜单的菜单选项上；

当光标位于想要的菜单选项上时，按下遥控器上的启动按钮；以及

其中还可以通过执行按压一个菜单选择按钮的步骤在任何时候选择想要的节目分类子菜单，每个菜单选择按钮相应于一个节目分类子菜单；以及

产生所选择的节目分类子菜单。

29、根据权利要求 28 的方法，其中光标移动是通过一操纵杆控制

的，并且该移动菜单光标的步骤包括：

转动操纵杆以将光标在相应于操纵杆转动方向的方向上移动。

30、根据权利要求 28 的方法，其中光标移动是通过一个球控制的，并且该移动菜单光标的步骤包括：

旋转该球以将光标在相应于球的旋转方向的方向上移动。

31、根据权利要求 30 的方法，其中该球是一个可按压的球，并且该按下启动按钮的步骤包括：

按下该可按压的球。

32、根据权利要求 28 的方法，其中光标移动是通过多个光标移动按钮控制的，每个按钮表示光标运动的一个不同的方向，并且其中移动菜单光标的步骤包括：

按下光标运动按钮以将光标在相应于由被按下的按钮表示的光标运动方向的方向上移动。

33、根据权利要求 32 的方法，其中光标移动按钮具有条纹，并且移动菜单光标的步骤还包括：

通过感觉光标移动按钮的条纹来识别该按钮。

34、根据权利要求 32 的方法，其中光标移动按钮与菜单选择按钮具有不同的颜色，并且该选择节目分类子菜单的步骤还包括：

通过观察按钮的颜色来区分光标移动按钮和菜单选择按钮。

35、根据权利要求 32 的方法，其中每个光标移动按钮都是倾斜的，并且移动菜单光标的步骤还包括：

通过感觉光标移动按钮的倾斜方向来识别该光标移动按钮。

36、根据权利要求 27 的方法，其中每个菜单选择按钮具有一个表示设置在其上的节目类别的图标，并且其中按下一个菜单选择按钮的步骤包括：

通过观察菜单选择按钮上的相应于想要的节目类别的图标来识别要按压的菜单选择按钮。

37、根据权利要求 23 的方法，其中其中每个菜单选择按钮具有一个表示设置在其上的节目类别的图标，并且其中按下一个菜单选择按钮的步骤包括：

通过观察菜单选择按钮上的相应于想要的节目类别的图标来识别要按压的菜单选择按钮。

说　　明　　书

有线电视发送系统先进机顶终端

本申请是 1993 年 12 月 9 日提交的发明名称为“有线电视发送系统先进机顶终端” 的中国专利申请 No. 93120185.3 的分案申请。

本发明涉及为消费者家庭提供电视节目编程能力的电视娱乐系统，特别是涉及一种为消费者提供节目选择的用户友好系统。

电视娱乐的进展一直主要由技术上的突破带动。1939 年，费拉基米尔·佐里金（Vladimir Zworykin）在显像管的进展促进了 NBC 开始其正式定时播送。1975 年，卫星技术的进步，能够为消费者家庭提供更多的节目。

这么多的技术突破，生产了一些对消费者并不便利的系统，常见的以三个遥控器，分别及单独遥控电视、有线电视盒及录像机的就是其中一个例子。最近，美国的某些地区在技术上已能向电视用户提供 100 个频道的节目。增大的节目容量已超过了很多消费者的使用能力，而一直没有向消费者提供一种掌握节目选择的方法。

消费者期望电视娱乐方面的进步，尤其是在节目及节目选择上的进步，是一种对消费者便利的方式。消费者的喜好，而不是技术上的突破，将推动至少今后 20 年的电视娱乐市场。正如计算机供应商经历了推销计算机硬件新技术到推销其较优适用性、界面及服务的转变，电视娱乐产业也将经历由新技术带动市场到由对消费者适用性带动市场的转变。

消费者需要具有实用新技术的产品，并且不会由于技术新颖有地位象征而购买产品。复杂硬件技术的进步开始超越一般消费者使用新技术的能力。要使新技术娱乐产品有用，且为消费者所需，需要做细致的工程工作。

为了使新的电视娱乐产品成功，就必须使其满足消费者的要求。电视消费者希望由受限制选择观看进步到有多种观看选择，由不能控制节目编排到完全控制编排。消费者希望在保持低花费的情况下，电视由麻烦、不便进步到方便而易于使用。消费者绝不愿意在缺乏编排节目信息而难以看到这些频道节目的情况下，支付 100 个频道的费用。

交互电视、高清晰度电视、及消费者家中 300 个频道的有线系统的概念，如果不进行分组、发送，及以对消费者有用的方式出现，则难以推销。问题是，电视节目的编排不是以一种对消费者友好的方式出现。

消费者已经受到了节目选择、大量 " 免费 " 频道预订有线频道和按观看场次收费的消费方式的冲击。若缺少对用户的考虑，则电视娱乐的增加，仍会令用户感到迷惑及不知所措。

电视工业在传统上一直以诸如连续馈送的广播和长期订购电影频道的大批量方式推销和出售它的节目，电视工业不能以诸如订购一个节目这样的以每个单元作为一个单位的方式大量出售它的节目。顾客更喜欢单元销售的方式，因为它能使费用低廉，并允许顾客对于他们观看节目更大的选择。

此外，已经开始的观众按节目分割播放方法将增加，而不以讨好用户的方式提供节目会使节目使节目的观众和收入都降低。随着节目播放

更加讨好用户，用户追求额外的特征和功能特征。

所需的是一个能通过一个使用户能容易地从许多精选节目进行选择的讨好用户的界面递送和提供电视节目的系统。

所需的是一个机顶转换器，它具有一个讨好用户的界面使用户能取得电视节目。

所需的是一个具有增强功能特性的机顶转换器。

所需的是一个给用户提供先进特征和功能的机顶转换器。

所需的是一个有效取得几百个电视节目选择的方法。

所需的是使现有机顶转换器功能升级的技术。

所需的是提供一种升级功能的硬件，使现有的机顶转换器技术能用于先进的节目递送系统中。

所需的是一个能在机顶转换器和电缆端头装置之间提供上游通讯能力的机顶转换器。

所需的是一个具有产生显示菜单能力的机顶转换器。

所需的是一个具有简单方式就能从菜单中选择一个节目的机顶转换器。

所需的是一个为统计目的监测订户观看选择的机顶转换器。

所需的是订户可在屏幕上预订专选频道的机顶转换器。

所需的是一个这样的机顶转换器，它能提供一个能将静止视频图像和活动视频图像相结合的高级屏电视菜单。

所需的是一个具有为菜单对视频图像定比例和重新修正功能的机顶转换器。

本发明即要满足以上要求。

本发明是一个电视节目递送系统的机顶转换箱或终端。更具体地说，本发明是在观众家里起一个终端作用的一个先进的机顶转换箱。该机顶终端是一个数字有线电视递送系统的关键部件，该机顶终端是一个提供数字节目信号解压缩的可升级的系统。优选的机顶终端既具有菜单产生的能力，又具有一些先进的特征和功能特性。

本发明的机顶终端可以通过对以下任何一个实施方案加一组硬件升级装置来实现：（1）一个现有的用一个电路插件（它具有一个与机顶转换器以电子学方式连接的微处理器）升级的机顶转换器；（2）一个可用升级模块或菜单产生插件升级的工业标准的解压缩转换器；（3）一个既能解压缩码又能产生菜单的机顶转换箱。这些硬件升级装置对这些实施方案中的任意一个都提供附加的先进特征和功能特性。

优选的机顶终端支持许多先进的特征和功能特性。这种机顶终端为订户提供画面重覆的功能而无需一个特殊的电视的电视机来支持该功能。该机顶终端还支持一个电视指南服务，为订户提供在其特定的订户位置可取得的所有节目播放的信息。该机顶终端还包括了询问观众以建立喜欢频道的次序表、询问个人情况资料和心情资料的能力。该机顶终端使订户能观看以后节目播放项目的促销性菜单。

该机顶终端还支持利用使订户能使用其它交互动性服务的硬件升级装置的附加能力。这些交互动性服务好参加联机问答活动，订购与确订机票以及取得各种各样的其它数据资料服务。该机顶终端利用一个数字调谐器作为硬件升级装置为订户提供一个数字单响功能。

优选的机顶终端可用来控制视频录像机，从而简化节目的记录。该机顶终端与该节目递送系统相结合能容易地支持高分析度电视（HDTV）。对于居住在边远地区的订户，该机顶终端可与后院卫星系统配合。除了该机顶终端用它当前的内部编程支持的所有特征外，通过对机顶终端220的遥控重新编程可以加入附加的特征或增加现有的特征。

本发明的目的是要提供一个用于订户取得电视节目的讨好用户的接口。

本发明的目的是允许订户利用在屏蔽上的菜单方便地浏览数百个节目播放的精选。

本发明的目的是要有效地取得数百个电视节目播放的选择。

本发明的目的是要使现有机顶转换器的功能特性升级。

本发明的目的是要提供一个允许在一先进的节目递送系统中使用现有机顶转换器的升级能力。

本发明的目的是要提供机顶转换器与电缆端头装置之间的上游通讯能力。

本发明的目的是要提供一个能产生显示菜单的机顶终端。

本发明的目的是允许用户能在屏幕上订购专门的频道。

本发明的目的是为统计监测订户观看的选择。

本发明的目的是要提供能够结合静止视频图像与运动视频图像的高级屏上电视菜单。

通过审阅以下说明部分，附图和所附的权利要求，本领域的专利人员显然了解本发明的上述这些及其它目的和优点，本技术领域的专利人

员在阅览过以下说明书、附图及权利要求后，将会明白了解。

以下是附图说明：

图 1 是该电视递送系统基本部件的示意图。

图 2 是该电视递送系统工作的概况图。

图 3 是该系统基本部件的一个工作示意图。

图 4 是该机顶终端硬件组成部分的方块图。

图 5a 是一个机顶终端的前部透视图。

图 5b 是一个机顶终端的后部透视图。

图 6 是用于机顶终端的一个快速电路（Tubo）插件的示意图。

图 7a 是一个节目控制信息信号一帧格式的图样。

图 7b 是来自机顶终端的调查答覆的一帧格式的图样。

图 8 是用于本发明中的基本菜单，包括由一些图代表的主菜单图样。

图 9a 是具有升级模块和相关连接的一个基本解压缩箱的示意图。

图 9b 是具有升级模块和相关连接的一个简单解压缩箱的方案的示意图。

图 10 是具有升级模块的一个简单解压缩箱的更详细的部件方框图。

图 11 是该机顶终端的上游数据通讯硬件的示意图。

图 12a 是显示 A 级、B 级和 C 级硬件升级装置部件的示意图。

图 12b 是显示 D 级硬件升级装置部件的示意图。

图 13a 是显示一遥控单元两部分的示意图。

图 13b 是优选遥控单元的一个图样。

图 14 是具有画面重叠功能的一个机顶终端的示意图。

图 15 是一个与节目一览表服务有关的菜单的图样。

图 16a 到 16d 是询问观众心情问题菜单的图样。

图 17a 和 17b 是适合于放行频道转换的机顶终端硬件组成部分的图样。

图 18 是用于机顶终端硬件升级装置的一个交互电视促销菜单的图样。

图 19a 和 19b 是利用 A 级硬件升级装置的交互电视服务的分菜单的图样。

图 20a 到 20d 是利用 B 级硬件升级装置与在屏幕上的飞机预订有关的互动式服务的图样。

图 21 是用于数字音响服务的菜单图样。

图 22 是与节目引导服务相关的一张菜单的图样。

图 23 是与高分析度电视（HDTV）节目播放有关的一张菜单的图样。

A、电视节目发送系统描述

1、介绍

图 1 表示本发明做为扩展有线电视节目发送系统 200 的一部分，利用压缩电视节目信号传输十分显著地增加了节目的可编能力。数字带宽压缩技术的发展使其比现有的或稍加修正的传输媒体具有更大的电视节目通过能力。所示电视节目发送系统 200 提供给节目订户一种用户友好界面，以开发运作比现有情况高出 6 倍或更多的节目供应能力。

订户能够得到扩展的电视节目组，并由菜单驱动通道方式看到订户

所选节目，从而使每个订户可以由按顺序排好的菜单单个地选择节目。订户使用简单的字母数字及图形符号通道，或在电视屏幕上移动光标及图形或亮块来编排菜单，只要按一下单个的按钮可以得到所要的节目，而不必调用存储器，也不必按动用来选择节目的两个或两个以上的实际数字号码。这样，订户只要按单个钮就可以从一个菜单进入下一个菜单。以此方式，订户可以从任何给出的菜单按顺序编排菜单和选择节目。节目被按类别分组，因此可以在同一菜单上得到类似的节目。

2、主要系统元件

此系统最基本的型式是使用一个发送节目系统 200 连接一个常规的链接有线电视系统 210。此节目发送系统 200 一般包括，（I）至少一个操作中心 202，节目分组及信息控制在此中心建立，而后以数字数据的形式组装成型。（II）一个数字压缩系统，数字数据在此系统中压缩、组合多通道化、编码及变换成用于天线传输到电缆端头 208 的数字信号，以及（III）一个内装压缩码解码器。节目发送系统 200 传输数字信号到电缆端头 208，在此端头处，信号被传达到链接有线电视系统 210。在电缆端头 208 内，接收到的信号可以被解码、解除多通道、由一局部中央分配及转换机制管理、组合，然后通过电缆系统 210 传输到位于每个节目订户家中的机顶终端 220。虽然连接有线电视系统 210 是最流行的家用传输媒体，但是电话线路、蜂窝式网络、光导纤维、个人通讯网络、以及类似的家用传输技术都可以与此节目供应系统 200 互换使用。

此发送系统200有一个具有内装压缩码解码能力的接收区域207。此能力是由一装于机顶终端 220 内的压缩码解码器预先规定的，机顶终端

220 装于每个节目订户家中。由节目订户的观点来看，此压缩码解码器是保持透明的，并且允许被压缩的信号解除多通道及个别地由混合数据流取出，然后按照节目订户的选择，个别地进行压缩码解码。压缩了的视频信号被转换成用于电视显示的模拟信号。这样的模拟信号包括用于标准电视的 NTSC 格式化信号。控制信号被类似地取出和被压缩码解码，然后或或是被立即执行，或是置于一局存储器内，例如随机存储器（RAM)。压缩码解码硬件的多通道装置可以用来将压缩码的视频信号解码及控制信号。机顶终端 220 能复盖或组合不同的信号以便在节目订户的电视上形成所要求的显示。视频信号的图形或一幅接一幅的画面就是此显示的实例。

虽然单个数字压缩标准（例如， MPEG）可用于节目供应系统 200 和链接有线电视系统 210，然而对两种系统所使用的压缩技术可能是不同的。当两种媒体间使用的压缩标准不同时，由电缆端头 208 接受到的信号，必须在由电缆端头 208 传输到机顶终端 220 之前施以压缩码解码。因此，电缆端头 208 必须再压缩及传输这些住以机顶终端 220，此终端可能使用一种特定的压缩码解码法算法对这些信号进行压缩码解码。

每个订户可以通过一个订户界面取得由机顶终端 220 接收的视频信号和控制信号所对应的特定的电视节目及菜单选择。订户界面是一种按钮位于机顶终端 220 或便携式遥控器 900 内的装置。在此优选系统实施例中，节目订户者界面是一种组合字符、数字、以及图形符号的遥控装置 900，此装置直接地或以菜单驱动方式提供节目通道。优选的订户界面也含有光标移动和启动按钮以及字母的、数字的、以及图形符号的按

钮。订户界面及菜单的安排使节目订户能够由几个在电视屏幕上显示的菜单中选择一些节目顺序编排。另外，使用者可以越过一些菜单屏幕，并以在订户者界面上选择合适的字符、数字或图形符号的组合立即选择节目。在此优选实施方案中，机顶终端 220 以建立特定菜单模板的陈列来产生在电视上显示的菜单，并且机顶终端 220 对每个可能的视频信号显示一特定的菜单或子菜单选择。

3、操作中心及数字压缩系统

操作中心 202 执行两种基本的服务，编组电视节目和制造节目控制信息信号。在此操作中心 202，电视节目以模拟及数字的形式将节目从外部分接收进来。

图 2 表示此操作中心从不同的外部来源 212 接收信号的一个实施例。外部节来源的例子有运动节目、儿童节目、专业频道、新闻或是任何可以提供音响及图像信号的节目来源。一旦操作中心 202 自外部来源收到任何模拟形式的信号，它将会使其数字化（并最好加以压缩）。此操作中心 202 也可具备节目内部存储器。内部存储的节目可以是模拟或数字形式，并存储于永久的或易失的存储源，包括磁带或随机存储器。操作中心 202 在收到节目后，以最易向节目预订者销售为目标来将其分组及分类。例如:操作中心 202 可以将同样的节目对周日、最佳收看时间、星期六下午收看时间分成不同的类别和菜单。操作中心 202 所编组的电视节目，便于不同的菜单说明节目，也便于节目预订者地通过菜取得节目。

在操作中心 202 中，用计算机辅助编组设备（CAP）来对数字信号

编组是典型的执行方式。计算机辅助编组设备计算机辅助编组设备系统一般包括至少一个计算机监视器、键盘、鼠标器及标准的视频编辑设备。程序员输入一定的信息到计算机辅助编助设备来编组信号。此信息包括日期、时间段及各种节目的节目类别。程序员和计算机辅助编组设备利用人口统计数据及分级来执行编组任务。程序员在由可提供节目的库存中选取不同节目及输入必要的信息后，在计算机辅助编组设备的帮助能够选择价格及对不同的节目分配应答器空间。处理过程完成后，计算机辅助编组设备显示对应于程序员输入的菜单草案或节目日程表。

计算机辅助编组设备也能够以图形方式显示应答器空间的分配。程序员可以多次编辑菜单和定位应答器直到满足节目时间表为止。当进行编辑时，程序对计算机辅助编组设备发出简单的指令便可以对准菜单上任何节目的准确位置。

编组过程也可以用卫星应答器解决必要的分组。操作中心 202 可将不同的节目组送到不同的电缆端头 208 和／或机顶终端 220。操作中心 202 可以完成此任务的一种方法是将不同的节目编组送到每个应答器。每个应答器，或是应答器组再将一特定的节目编组转发到特定的电缆端头 208 和／或机顶终端 220。应答器空间的定位是操作中心 202 所执行的一个重要任务。

操作中心 202 也可以为占用地方节目时间在编组信号中 " 插入 " 指示，使地方有线电视公司及电视公司以地方广告和／或地方节目来占据节目时间。因此，地方电缆端头 208 就不会被限制仅仅演播放从操作中心 202 传输来的节目。新型机顶转换器将使数字及模拟的两种频道结

合。因此，电缆端头 208 能够在传送节目信号传送到机顶终端 220 之前将数字信号与模拟信号相结合。

计算机辅助编组设备将节目编组后，即产生一个节目控制信息信号，此信号与节目编组一同发送到电缆端头208和／或机顶终端220。此节目控制信号含有节目组内容的描述、送到电缆端头 208 和／或机顶终端 220 的指令，以及其他有关信号传输的信息。

除了将信号编组之外，操作中心 202 使用数字压缩技术来将已有的天线应答器能力至少按 4:1 的比率增加，从而使节目发送能力提高 4 倍。现有的一些数字压缩算法能够增加能力及按系统要求改进信号质量。

此算法一般使用一个或多于 3 个的基本数字压缩技术：（1）帧内压缩，（2）帧对帧压缩，（3）载波内压缩。特别是，在优选实施例中，使用了 MPEG2 压缩方法。经过数字压缩，信号被混合（多通道化）和数码化。然后，混合的信号被传送到不同的上行路段 204。

每个操作中心 202 可以有单个的上行线路段 204 或多个的上行线路段（在图 1 中，以 204 代表的假想图表示）。上行线路段 204 可以与操作中心 202 位于同一地理位置或是远离操作中心。一旦此复合信号被传送到上行线路 204，此信号即可与其他信号复合、调制、向上变频和放大后经过卫星传输。多通道电缆端头 208 可以接收这类的传输。

除多重上行线路外，发送系统 200 也可以包含有多个操作中心。使用多个操作中心的优选方法是指定操作中心中的一个作为主要操作中心，并分配剩下的操作中心作为从属的操作中心。在此结构中，主要操作中心协调从属操作中心之间的各种功能，例如同时传输的同步化和有

效地分散操作的工作负荷。

4、 电缆端头

操作中心 202 将节目信号压缩及代码化并传送此信号到卫星后，电缆端头 208 接收并在将这些信号转送到每个机顶终端 220 之前将其进行进一步的处理。在每个电缆端头处，一般情况下装设有多重卫星接收盘。每个接收盘能够处理来自单个卫星及有时来自多个卫星的多路应答信号。

作为机顶终端 220 和操作中心 202（或其他远处工作点）之间的媒介，电缆端头 208 具有两个主要的功能。首先，电缆端头 208 做为信号分配中心或信号处理器，可将节目信号转送到在每个节目订户家中的机顶终端 220。此外，电缆端头 208 做为一个网络控制器 214，可从每个机顶终端 220 接收信息， 并将这样的信息传送到一个信息收集处，例如操作中心 202。

图 3 表示一个实例。此例中，电缆端头 208 和节目订户的家由特定通讯媒体 216 连系起来。在此特定实例中，模拟信号，数字压缩信号、其他数字信号和逆间 / 互动信号经过媒体216发送和接收。电缆端头208可以做为有如信号处理器 209 和网络控制器 214 的双重角色，提供信号处理。

作为信号处理器 209，电缆端头 208 将其接收到的节目信号设备传输到每个机顶终端 220 处。在此优选系统中，信号处理器 209 重定路经或是分离重新组合由操作中心 202 接收到的信号和数字信息，并将不同的信号区域部署到不同的频率范围内。可向不同节目订户提供不同节目

的电缆端头 208，可以部署来自操作中心 202 的节目信号，以各种方式去适应不同的观众。信号处理器 209 也可以将地方节目和／或地方广告结合到节目信号中，并将此修改过的信号向前传到机顶终端 220。为了适应地方节目编排的可用性，信号理器 209 必须以数字或模拟形式地方信号与操作中心节目信号结合。假若地方有线系统使用的压缩标准不同于操作中心 202 所使用的，则信号处理中心 209 必须将进入的信号进行压缩解码和再压缩，以使其以合适的格式传送到机顶终端 220。随着标准的发展（即 MPEG2），此处理过程就变得不那么重要了。此外，信号处理器 209 执行任何必须的信号译码和／或编码。

作为网络控制器 214，电缆端头 208 为该系统执行系统控制功能。网络控制器 214 的重要功能是管理机顶终端 220 的配置和处理机顶终端 220 接收到的信号。在此优选的实施例中，网络控制器 214 所监视的包括自动定时询问并返回来自远在每个节目订户中的机顶终端 220 的反应。定时询问及自动报回的循环频繁进行到可以满足网络控制器 214 保持准确记录帐单的程度，并监视规定的频道通路。举最简单的实例，被送到网络控制器 214 的信息将被存入随机存储器中，此随机存储器在每个节订户的机顶终端 220 内，并且此信息仅仅按照网络控制器 214 的定时询问被修正。

这种修正可以每天、每周或每个月进行。网络控制器 214 利用一个特定的机顶终端 220，可使此系统对所有观看的节目保持完整的信息。

网络控制器 214 也能够调整操作中心 202 接收到的节目控制信息信号来响应机顶终端 220 的即时需要。因此，网络控制器 214 能够使发送

系统适应个别机顶终端 220 的特殊要求，如若此特殊要求不能事先提供给操作中心 202。换句话说，网络控制器 214 能够对正在进行的节目做出改变。以其所具有的此种能力，网络控制器 214 能够掌握复杂的地方编程需要，例如互动电视服务，分割式屏幕的录像技术，以及对同一个录像节目选择不同的外国语言。此外，网络控制器 214 控制并监视系统中所有的压缩码机及压缩码解码机。

发送系统200和优选实施方案的数字压缩提供了一条自操作中心202到电缆端头 208 的单方向通道。现状及记帐的信息从机顶终端 220 被送到在电缆端头208处的网络控制器214处不是直接送到操作中心202。因此，节目监测及选择控制只会在地方有线电视公司和已分散的网络控制器 214（即相对操作中心 202 而言已分散，操作中心 202 于节目发送系统 200 而言集中）之下在电缆端头 208 进行。然后地方有线电视公司将与操作中心 202 或区域控制中心（图上未表示）交流，操作中心累积从机顶终端 220 返回的数据以用于统计及记帐。在备用系统的实施例中，操作中心和统计及记帐区布配在一起。此外，装有调制解调器的电话线路可以用来把机顶终端220的信息传输到统计及记帐区。

5、 机顶终端

机顶终端 220 是发送系统 200 置于节目订户家中的部分。机顶终端 220 一般放置在订户的电视机上面或下面，但是它也是可以放置于节目订户的家中任何地方或附近，只要它在节目预订者的遥控 900 的作用范围内即可。在某些方面，机顶终端 220 可能类似已被很多有线电视系统使用的转换盒。例如，每个机顶终端220可能包含一些错误检测、译码、

和类似反例用编码的编码技术。不过，从下面的讨论将会明显地看出，机顶终端 220 是能够执行很多一般的转换器无法执行的功能。

机顶终端 220 有多个输入及输出口，使其能与其他的地方及远处的装置沟通。机顶终端 220 有一个从电缆端头 208 接收信息的输入口。此外，此单元至少有两个输出口，此输出口将机顶终端 220 的通讯提供给电视机及录像机。某些菜单选择可能引起机顶终端 220 直接发送控制信息到录放像机以便自动地对录像机进行编程及操作。还有，机顶终端 220 包括一个要用于维护设备、查找故障、重编程序和附加顾客的服务的电话插座。机顶终端 220 也可能包含立体声 / 音响输出端和一个卫星天线输入口。

从功能性来看，机顶终端 220 是此发送系统链上的最后一个元件。机顶终端 220 接收来自电缆端头 208（或者，在某些情况下来自操作中心 202）的被压缩的节目和控制信号。机顶终端 220 直接收单个的被压缩的节目和控制信号之后。这些信号被分离、解除压缩、转换成模拟信号（假若必须的话），并且或是被放置于局部存储器中（菜单模板可以由此处产生），即时被执行，或是直接被送到电视屏幕。

在处理了某些由电缆端头 208 接收的信号之后，机顶终端 220 能够存储菜单模板，用以产生菜单，这些菜单将使用一个菜单模板阵列将其显示在节目预订者的电视上。在菜单构成之前，必须做出菜单模板并将其送到机顶终端 220 存储。一个微处理器使用由操作中心 202 或电缆端头 208 接收到的控制信号来做出用于存储的菜单模板。每个菜单模板可以存在机顶终端 220 的易失性存储器内。当机顶终端接收模板信息时，

它将由电缆端头 208 接收到的信号分解为四个主要的部分：视频、图象、程序逻辑和文字。每个菜单模板代表整个菜单上的一个不同部分，诸如菜单背景、电视标识、光标高亮度覆盖，或是构成菜单所需要的各种各类的元件。菜单模板可以用由操作中心 202 或电缆端头 208 接收到的控制信号来取消或改换。

一旦菜单模板已经被存储于存储器中，机顶终端 220 就可以产生合适的菜单。在此优选实施例中，基本菜单格式信息被存于机顶终端 220 内的存储器中，从而使微处理器能局部地接通来自机顶终端的信息而不是接通来自输入信号的信息。微处理器由菜单模板和其他存于存储器内菜单信息产生合适的菜单。然后，机顶终端 220 接着在节目订户的电视屏幕上，对应节目预定者选择的输入显示出特定菜单。

若节目订户从菜单上选择一个特定的节目，机顶终端 220 将指明在哪个频道上该节目会被放演、分离信号和抽出由电缆端头 208 会传输来的信号频道。机顶终端 220 然后将此频道解除压缩，并且如果有需要，转换节目信号为一模拟 NTSC 信号以使节目预订者能够看到所选节目。机顶终端 220 能够被装备成能使一个以上的节目信号解除压缩，但是这样做会毫无必要地将此装置的费用加上去，因为节目预订者一般在一个时间内仅仅会只看一个节目。不过，可能有必要使用两个或三个压缩码解码器来提供一个图面接换一个图面的能力、控制信号解除压缩、加强频道转换接能力或类似功能。

除了菜单信息之外，机顶终端 220 也可以存储由电缆端头 208 或操作中心 202 传输来的文字。这些文字能够通知节目预订者即将到来的节

目、收费和帐号情况，新的可预订的节目或其他有关的信息。文字将根据于使用文字信息持续时间和频率存储在合适的位置。

此外，选择升级的办法可以加强节目预订者的机顶终端 220 的性能。升级可以由盒卡或是计算机卡（图上未示出）构成，此盒卡或计算机卡被插入机顶终端 220 内的一个扩展口内；升级也可以由电缆端头 208 或操作中心 202 提供的性能来做到，使用者可以此电端端头 208 或操作中心 202 预订节目。 可能的升级可以包括在线数据基础服务、互动性多媒体服务、数字无线电广播频道通道，以及其他服务。

举一最简单的实例，由通用仪器公司（General Instruments）或是亚特兰大科技公司（Scientific Atlanta）制造的转换器箱可以通过改善和升级来执行机顶终端 220 的功能。优选的升级办法是用一个具有微处理器的电路卡，此卡以电子方法连接于或是插入转换器箱。

节目和订户机顶终端 220 之间的重要通讯通道是节目订界面，最好是遥控装置 900。通过使用此界面，节目预订者可以通过系统的菜单驱动图表机制或用实际的频道号码直接进入特定的通道的方法来选择所要的节目。通过使用此界面，订户能够通过一系列提供信息的节目选择菜单来达到目的。使用菜单驱动、图形符号、或是字符通道，节目订户只须简单地按一个单个的按钮而不是从存储器中重新取出或按下实际的频道号码来做出选择。订户可用遥控器 900 上的数字键（按下相应的频道号），或是菜单图形符号选择，得到常规的广播和基本的有线电视站的信息。

除了使节目订户能够容易地与有线电视系统 200 交流配合之外，订

户界面 900 的实质特点也增加系统的客户友好性。使用者应该可以轻易地将遥控器 900 掌握在手中。优选遥控器 900 的按钮含有绘成图形的号，使订户容易地辨认。当然执行类似功能的按钮也可能以颜色配位和由有区别的文字组成以增加系统的用户友好性。

7、 菜单驱动节目选择

菜单驱动机制提供给订户可以一步就进入所有主要菜单的方法，这些菜单可以从流行影片、体育运动节目，到特定节目来归类。订户可以从主菜单中的任何一个以光标或字符通道地进入了菜单和次要菜单。

优选实施方案利用两种不同型式的菜单，即节目选择菜单和正在上演节目的菜单。第一系列的菜单，即节目选择菜单，由介绍基地，主菜单和子菜单构成。第二系列菜单，即正在上演节目的菜单，由两种主要型式构成，即隐式菜单和节目覆盖菜单。

当节目订户打开机顶终端 220 时，介绍菜单将立即欢迎节目订户进入此系统。介绍菜单也可能播放来自地方有线电视系统的重要通告，有线电视提供者的广告，或其他形式的信息。此外，假若电缆端头 208 发送了一个个人信息给节目预定者的特定的机顶终端 220，那么介绍菜单能够通知节目订户。

演示了介绍菜单之后，节目订户可以进入了一级菜单，也就是基地菜单（Home Menu）。在优选实施方案中，一段时间之后，有线电视系统将引导订户自动进入基地菜单。订户可以从基地菜单进入所有的节目编排选择。订户既可以从遥控器 900 输入合适的频道号码来直接选择节目，也要以不断地由基地菜单开始来增加菜单选择的层次。对应于第一级菜

单的基地菜单的类型称做主菜单。

假若节目订户一个接一个地通过相继的菜单来选择，则节目订户将进入对应由基地菜单来的选择类别的主菜单。主菜单进一步为节目预定者的要求进行搜寻，并帮助引导节目订户达到其所选择。

订户可以由主菜单进入几个子菜单。从每个子菜单，订户可以进入其他子菜单，直到节目预订者找到一个想要的电视节目。子菜单与主菜单相似，可以进一步按要求进行搜寻。此系统也可以使节目订户跳越过某些菜单或子菜单，只要输入一个合适的指令给遥控器 900 就可以直接进入特定的菜单或电视节目。

机顶终端 220 只有在节目订户已经选择了一个电视节目之后才演示正在上演的菜单（包括隐式菜单及节目覆盖菜单）。为避免打搅订户，机顶终端决不演示隐式菜单，直到订户选择合适的情况来演示隐式菜单。隐式菜单包含与被观众选中的节目有关的选择。例如，隐式菜单可能含有一些选择，使订户进入一个互动模式或是从所选择的节目退出。

节目复盖单与隐式菜单近似，因为它们均发生在节目进行中并与正在观看的节目相关。然而，节目覆盖菜单是与节目预订者所选的菜单同时演示的。大部分的节目覆盖菜单在电视屏幕上所占位置小到中以使节目订户舒适地继续观看所选择的节目。

B、详细的机顶终端说明

机顶终端220接收并处理来自电缆端头208的信号。此机顶终端220备有局部计算机存储器，并有数字压缩信号的译码能力，此信号用于产

生给节目预订者用的菜单。遥控器 900 将节目预订者的选择传递给机顶终端 220。节目订户的选择一般是基于菜单或是电视屏幕显示的其它提示。

最好是，信号以压缩码的格式到达节目订户的家中，并在观看之前被解除压缩。所发送的节目信号包括使节目订户家中的设备能演示用于选择特定节目的菜单的。根据此特定的实施方案，电视节目信号可以通过一个或多个连接线路到达节目订户家中，这些连接可以是同轴电缆、光导纤维电缆、双绞线、无线电话线或个人通讯网路（PCN）连接器。

节目控制信息信号由操作中心 202 产生，并且对网络控制器 214 提供节目说明及日程数据。在另外一种配置的，情况数据直接送到机顶终端 220 用以对节目预定者显示。在此优选实施方案中，节目控制信息信号由网络控制器 214 存储及修正，并被以机顶终端控制信息流（STTCIS）的形式送到机顶终端 220。机顶终端 220 将或是节目控制信息信号或是机顶终端控制信息流与存在机顶终端 220 的存储器内的数据结合起来，以产生协助节目预订者选择表演节目的屏上菜单。

能被以节目控制信号发送的信息形式包括：节目分类数目、节目分类名称、被分配给一特定分类的频道（例如专业频道）、频道的名称、在每个频道上的节目的名称、节目开始时间、节目的长度、节目的内容说明、分配给每个节目的菜单、价格、是否具备节目广告和任何其他的节目、菜单或是产品的信息。

机顶终端 220 能够在常规基础上，以正在传送到机顶终端 220 处的最少数量的信息，指明对于每个节目的合适的菜单位置及合适的时间、

以及在节目预定者选定菜单之后的启动频道。节目控制信息信号及机顶终端控制信号流能够被以不同的方式格式化，并且能够以不同的方法来产生屏上菜单。例如，假若节目控制信息信号没有载有菜单格式化信息，则有于建立菜单格式会被固定在机顶终端 220 的只读存储器内。

在此优选实施例中，菜单格式化信息是被存储于机顶终端 220 的临时存储装置，例如随机存储器或电可编程序只读存储器内。每当希望改变菜单格式时，新的菜单格式化信息将通过节目控制信息信号，或是机顶终端控制信号流被送到机顶终端 220 处。

在最简单的实例中，菜单格式保持固定不变而仅仅是文字有所改变。以此方法，节目控制信息信号能够主要地被限制在文字中，而且机顶终端 220 可以使用一个文字产出器。另一简单的实例是使用分开的频道，全部时间（大带宽）只用于菜单信息。

现场的视频信号可能被用于某种菜单的窗口。这种视频信号可以用节目控制信息信号或机顶终端控制信号流传送，也可将其从正与菜单播放同时传输的频道上取出。 用于菜单的视频信号， 电视节目预告或示范播放可以几种格式送到机顶终端 220， 这些格式包括：（1）在一专用频道上，（2）在一常规的节目频道上并按比例定尺寸，（3）随同节目控制信号。然而，在此优选实施例方案中，数量大的各种简短节目预告或示范影片的播放是用一种在专用频道上的屏幕分割技术来发送的。一种多路窗口技术与菜单共用以显示菜目内容说明和一个或多个电视画面，以便协助节目订户选择节目。

图 4 表示机顶终端 220 的基本硬件元件。机顶终端 220 有一个调谐

器 603，数字解调器 606，译码器 600，及多路解调器 609、616，以及音频装置 612，和一遥控制界面 626，此界面用于接收及处理来自遥控单元 900 的信号。一个附加调制解调器 627 可允许在微处理器 602 及电缆端头 208 间进行通讯。一个 NTSC 编码器 625 提供标准的 NTSC 视频信号输出。

微处理器 602 有能力执行存于存储器内的程序指令。此指令允许用户用遥控器 900 做选择，进入各种菜单。

视频信号的解除压缩以及由节目控制信息信号或机顶终端控制信号流来产生菜单的方式是按照本发明的特定实施方案而不同的。如要压缩视频信号的话，则可使用视频信号压缩码解码器 618 和 622。节目控制信息信号可能被解除调制而进入其组成部件，并且，视频信号压缩码解码器 618，图形压缩码解码器、文字产生器以及视频信号组合器 624 可以用来协助建立菜单。

除了存储于图形存储器的菜单格式信息之外，机顶终端 220 还储存追踪选择观看节目的数据机顶终端 220 可以将收集来的数据存入电可编程序只读存储器或随机存储器，对所有进入的／被看的节目保持一个精确的记录。之后，此数据可以被传输到电缆端头 208，在此处，该信号可被用以进行网络控制和监视功能。在机顶终端 220 和电缆端头之间的数据传输，可以通过在有线网络上的逆流传输，或是使用电话调制解调器等方式来完成。当使用有一网路上的逆流传输时，机顶终端 220 可以按一时间表完成数据传输（例如，使用定时询问反应或由电缆端头 208 处传来的回应定时询问的情况报告），或基于需要（例如，使用定时询

问反应或由电缆端头 208 处传来的回应定时询问的情况报告，或基于需要（例如，随机存取技术）完成此数据传输。

图 5a 表示机顶终端 220 的前控制盘，此盘包括有一红外线传感器 630 和一系列的大电子显示器 640。大电子显示器 640 可以用图像或字母（例如 A—K）指明由机顶终端 220 或由用户当时直接选择的频道选出的主菜单， 或是菜单频道选择（例如自 1 到 50）。再者，显示器可能包括现时频道，时间，声量，睡眠时间、双亲锁（安全），帐号收支情况，升级硬件的使用，正在被录像机记录的第二频道，在分开的房间中 D 级音乐硬件升级的使用，或其他的对节目预订者指出机顶终端 220 的现时情况的有用显示。大电子显示器 640 也可能提供一个现时扩放的数字音响频道的指示。

机顶终端 220 的前端包括有一个带活盖的开口 635，并可以在开口中插入磁性盒式存储器（或者更小的便携式存储装置，包括光盘，只读存储器，由电可编程序只读存储器等，图上未示出）。此盒式存储器开口 635 允许机机终端 220 使用磁带盒式存储器来升级或再编程序。

机顶终端 220 的顶上或盖子上有按钮控制器 645。遥控装置可以执行的任何功能，机顶终端 220 使用复制钮控制器 645 也同样可以执行。

图 5b 表示机顶终端 220 的后面，其中包括有一对输出接线端子 650，一对输入端子 652，一对立体声 / 音响输出端子 654，卫星盘输入口 656，电话插口 658 和一个 RS—422 接口 660。此外，一个升级口 662 和一个盖板 664 由金属螺钉固定。输出端子 650 中的一个用于电视，另外的用于录像机。机顶终端 220 有能力处理来自使用输入端子 652 的一根或两

根电缆的信号。电话插口 658 和一个 RS－232 或 RS－422 接口 660 是供维护设备，消除故障，再编程序和添加顾客服务的。在另一可替代的实施方案中，电话插口 658 可能被用做在电缆端头 208 和机顶终端 220 之间的主要的通讯模式。通过地方电话、无线电话或个人通讯网络，这种连接是可能的。

每个机顶终端 220 的基本编程是在机顶终端 220 内的只读存储器内进行的。随机存取存储器、磁性盒式存储器的容量、扩展卡开口 635，使得在机顶终端 220 上进行升级变得容易了。

在此优选实例中，除了扩展卡开口之外，机顶终端 220 还有一个硬件升级开口 662，用于连接：（1）一个校正的错误，机顶终端 220 的数据输出的译码，（2）一个控制界面，（3）对视频信号之输出解除压缩码，和（4）一个视频信号输入口的四线（或更多）连接。在此优选实施方案中，多芯线被用来执行四个功能中的每一个。四套线合在一起装在一个具有单个多针连接的单个电缆中。

在此优选实施方案中，多针连接器可用于多线电缆。多针连接器 662 可用在从 DB9 到 DB25 的范围。各种小型计算机系统的界面（SCSI）接口也可以用来代替上述的单接口。此外，也可以连接在单一电缆上四个式以上的输入口取代单一的多针连接器。

另一个接口 662 被用来将下述的不同的硬件升级附在机顶终端 220 上。 此优选实施方案中有一些可与机顶终端 220 一同使用的硬件升级，包括有：（1）一个 A 级互动单元，（2）一个 B 级互动单元，（3）一个 C 级的具有光盘能力的互动单元，（4）一个 D 级的用于分开房间的无线电

调谐器，和（5）一个 E 级的信息下装单元。每个这样的升级都可能通过早先描述过的升级接口 662 被连接到机顶终端 220 处。早先描述过的在一单个电缆中的同一芯线可以被使用。

所有的机顶转换器，例如亚特兰大科技公司（Scientific Atlanta）或通用仪器公司（General Instruments）所制造的，目前不具有处理本发明的菜单选择系统的能力。因此，为了以现有的机顶转换器技术来使用菜单选择系统，硬件的修改就是必须的问题。

一个加速卡附在机顶转换器上的情况如图 6 所示。所示加速卡 700 提供了以现有的机顶转换器技术使用菜单所需要的附加功能。加速卡 700 加到机顶转换器地重要功能是解释节目控制信息信号、产生菜单、将菜单编顺序和最后观众能够做到勿需输入任何频道识别信息就可通过菜单系统选择系统频道。加速卡也提供一种用于远处（例如电缆端头 208）的接收所有节目信息和控制机顶转换器和加速卡 700 的方法。 所看节目信息和控制指令可能从电缆端头 208 利用电话线通到加速卡 700。

加速卡 700 的重要元件有：一个个人电脑芯片中心处理器（CPU）702，一个 VGA 图形控制器 704，一个视频信号组合器 706，逻辑线路系统 708，NTSC 编码盘 710，一个接收器 712，解调器 714 和一个拨码盘 716。加速卡 700 由接收通过同轴电缆从电缆端头 208 传来的节目控制信息卡来操作。加速卡 700 的逻辑电路系统 708 接收数据、红外线指令、并从机顶转换器来使信号同步化。 由观众以遥控器 900 做的菜单选择是被机上转换器的 IR 接收并传递到加速卡 700。 加速卡 700 译码信号并写明观众已选定的节目（或菜单）。 加速卡 700 调整 IR 指令以便将节目

选择信息送到机顶转换器 221。 被调整过 IR 指令包含有机顶转换器所需的频道信息。 使用电话线路及拨码盘 716，加速卡 700 能够传输节目访问信息到电缆端头 208。

在此优选实施方案中，节目访问信息被存在每个机顶终端 220，直到网络控制器 214 以图 7a 所示的定时询问信息格式来定时询问这些信息为止。 这种帧格式 920 包括有 6 部分信息组，称为：（1）位于信息开始处的一先前标志 922，（2）地址字段 924，（3）订户区域标记 926，（4）机顶终端识别器 928，它包括查询命令 / 回答（或 P / F）位 930，（5）信息段 932，和（6）位于信息结构处的在后沿标志。图 7b 表示一个查询信息及应答格式 920′（类似于查询要求信息及应答格式 920 的结局，因此，一般以在图 7a 中的询问格式说明，但是为了清晰，需加上原来的指令），此应答格式回答图 7a 所示的定时询问。

8 位标记指令系列 922 出现查询要求信息的开始及末了，并用以建立及保持同步。这样的指令系列典型地由一个 "01111110" 的数位串构成。地址字段 924 将一个四位数的地址分配给一个给定的机顶终端 220。订户区域标记 926 是一个千位数的信息组，此信息组指出订户的机顶终端 220 所驻的地理位置。 机顶终端识别器 928 是一个 16 位场，用以单值地识别每个机顶终端 220，此 16 位场具有 15 位标准码及附于此码后的 P / F 位 930。当然，这个例子也提供了场的尺寸，本发明也可以使用各种尺寸。

P / F 位 930 被用以命令查询来自指定地址为机顶终端 220 的应答，以上情况将如下所述。应答帧格式 920′ 也提供一个可变长度的信息场

932′，以用于其他的数据传输，例如系统的信息更新。帧格式 920′ 是以一个 8 位标志（或尾标）934 来结束的，此 8 位标志，在格式上完全与引导标志 922′ 相同，如上所述。其他帧格式（如 MPEG）也将明显的有此技能，而且很容易与此系统适配使用。

如上综述，通过一系列的菜单可以选择图像及节目演示。图 8 表示一系列的可能结构的例子。总的来说，菜单的顺序是以一个介绍菜单、一个基地菜单、各种主菜单和很多子菜单构成的。子菜单可包括节目预千菜单和正在上演的节目菜单。 例如，在菜单序列的基地菜单部分，和对应的软件程序部分，订户可以选择主菜单中的一个并启动菜单系列演示。另外，订户也可按下一个在遥控器 900 上的菜单选择按钮来直接启动主菜单。

在任何菜单进行过程中，订户都可以释放主菜单按钮来移动主菜单以另外的菜单系列。以此方法，订户可以从一个主菜单移到另一个主菜单。

微处理器 602 所执行的各种软件子程序可允许订户将菜单编顺序，并在本发明的各种各样菜单中操作。订户也可以只按一下遥控器 900 上基地菜单按钮来使菜单回到原来的顺序位置。

介绍菜单屏幕 1000 接通电源后自动地显示，使机顶终端 200 初始化。机顶终端软件一般情况下将建议订户自此介绍菜单屏幕 1000 进到基地菜单屏幕 1010。基地菜单 1010 是这样的基础菜单，其可使订户为了达到第一级观看决定而返回。当机顶终端软件正在显示基地菜单 1010 时，订户能够进入任何选择的电视节目，软件允许节目选择以光标在屏

幕上的移动和直接选择用遥控器 900 上的按钮来进行。

在一般通过菜单屏幕的进程中，软件将使订户进到主菜单屏幕 1020 以回答遥控器 900 或高亮度光标自基地菜单屏 1010 的选择。 在基地菜单 1010 显示出的选择是大范围的节目选择。

主菜单 1020 之后，订户可以通过一个或多个子菜单屏幕 1050 进行操作，并可由此来选择一个特定的观看节目。 对大多数的节目选择情况而言， 使用者将从基地菜单 1010 到主菜单 1020，然后再到一个或多个子菜单来进行其选择程序。然而，对某一个节目选择或是机顶终端 220 的功能而言，使用者可以在菜单顺序中越过一个或多个菜单。

正在上演的节目菜单 1200 是子菜单，只有在订户已选择了电视节目之后，机顶终端软件才能使其工作。 这些菜单提供给订户在观看选择节目时附加的功能及附加的信息。 正在上演的节目菜单的序列可以进一步被再分为至少两种型式的菜单，即隐式菜单 1380 和节目覆盖菜单 1390。

为了避免干搅正在观看节目的订户， 隐式菜单 1380 并不对订户显示而是将其 " 放置 " 在机顶终端 220 的微处理器 602 处。微处理器 602 在执行任何隐式菜单 1380 选择的显示之前， 需要等候一个或是来自遥控器 900 的， 或是来自机顶终端 220 的按钮输入信号。 机顶终端软件向节目预订者提供附加功能， 例如进入一种互动方式， 或是通过隐式菜单 1380 而退出所选择的节目。

节目覆盖菜单 1390 类似于隐式菜单 1380。 但是， 节目覆盖菜单 1390 是被覆盖在显示的画面的部分上， 而不是隐藏在后。 节目覆盖菜

单 1390 的软件允许订户继续伴随音响信号观看所选择的电视节目， 而把图形信息置于电视屏幕的一部分。 大多数的节目覆盖菜单 1390 是被以图形并用去覆盖画面的一小部分。一些覆盖菜单 1390 以其特点而言比正在被看的节目更重要， 将覆盖画面的大部分。 覆盖菜单 1390 一种形式的例子包括通告菜单 1392 和确认菜单 1394。 在此优选实施方案中， 用于节目覆盖菜单 1390 的软件，控制减少或是缩小比例（整个的）以及将画面转移到屏幕的另一部分。

子菜单提供按每小时和每分钟计算的观看节目应付费用及节目长度。 订户可自子菜单得到至少三种选择：（1）定购节目， （2）因到先前的菜单， （3）按下 "启动（go）" 并回到通常的电视。 订户也可以取得其它的选择权， 如观看预告片。

以使用一个屏上菜单来选择节目， 可向订户显示的菜单几乎是没有限制数目的。 机顶终端 220 的存储器的容量， 以及使用节目控制信息信号传送的信息数量， 是限制菜单数目和能向订户显示的信息数量的仅有限制。 使用有三个简单的顺序的一系列菜单可以让订户用机顶终端 220 和遥控器 900 以光标移动方式来达到容易使用和执行简单两个方面、 界面软件编程者的用户将会从优选实施方案的描述发现很多明显的不同。

机顶终端 200 部份地使用存于它的图形存储器内的信息产生及创建菜单。 背景图形文件 800 将存储菜单背景， 标识图形文件将存储任何必要的标识。 菜单显示和光标图形文件将存储菜单显示块和光标高亮度覆盖， 以及任何其他的各种建立菜单所需的杂项文件。使用这样存

储菜单的方法， 通过来自网络控制器 214 或操作中心 202 的指令将机顶终端 220 的图形存储器重新编程序， 就可以改变菜单。

微处理器 602 使用存储的信息执行建立菜单需要的程序。 在大多数例子中微处理器 602 取出背景文件、标志图形文件、 菜单显示和光标文件。 微处理器 602 自长期、 中期或短期存储器中取出文字， 取决于文字内容存于何处。 使用视频信号组合器（或类似装置），被存储的信息与视频信号相混合， 并将完整的图像送到电视屏幕显示。

在此优选实施方案中， 图形控制器被用来协助机顶终端 220 产生菜单。 机顶终端 220 产生菜单始于建立主菜单屏幕， 此主菜单屏幕包括用于主菜单的背景图形。 背景图形可能包括一个跨越屏幕顶部的可移动的上框， 和跨越屏幕底部的可移动下框。 背景图形可以从图形存储器（优选可编可擦程序只读存储器）的存储文件的背景图形文件 800 来产生。 此外， 标识图形也可能被产生。 此种图形也可能被产生。 此种图形，典型地包括图形符号窗口、 有线电视公司标识， 频道公司标识， 和两个 " 启动（go）" 按钮。

最好， 每个主菜单的文字被机顶终端 220 中的文字产生器分别地产生是最理想的。 一般情况在几星期几个月时期内保持不变的文字部分可以被存在 EEPROM（可编可擦程序的只读存储器）或其他的局部存储器内。 经常变化的文字， 诸如影片名称（或其他节目选择）， 或是操作中心 202， 或是电缆端头 208 传送到电缆端头 208 的网络控制器 214。可以用修改由操作中心 202 传送来的节目控制信息信号来改变在任何主菜单 1020 上的节目选择， 并用 STTCIS（机顶终端控制信息流）来传送

任何改变。

星期几， 日期和时间信息被加到每个主菜单上。此信息由操作中心 202， 电缆端头 208（信号处理器 209 或网络控制器 214）， 上行线路段传送来， 或是由机顶终端 220 内部产生的。

节目说明子菜单的建立及演示是由机顶终端 220 用于上面所描述的类似方式来执行的。 每个子菜单在被送到电视屏幕之前可能被部分地产生和组合。 最好的是可以使用背景图形和可移动的上框及下框。 同样地，电视图像窗口和半连带式窗口可用存在 EEPROM（可编可擦程序只读存储器）的信息来产生。

除图像及文字内容之外，一些子菜单包括示出电视图像的窗口。这样的电视图像可以是静止的或是移动画面的。 静止的画面可以以压缩的格式（如 JPEG）存于机顶终端 220 处。 电视静止画面仍可被操作中心 202 以节目控制信息信号不断地传输。

移动的电视画面可如上所述直接由现时的节目供应得到。 依电视窗口的尺寸而定， 这样做需要处理电视面信号， 包括缩小电视画面的比例尺寸及改变电视画面到菜单屏幕的部位， 此部位是在菜单窗口中。另一方面， 电视画面也可以从分割的屏幕频道得到。 这样的方法涉及了分割屏幕电视技术在指定的时间、 在单个频道上输送多个电视画面链。 机顶终端 220 可能改变图面比例（假如需要的话）， 并利用已知的变比例及定位技术， 机顶终端 220 内可能需要附加的电路系统。

为了避免重导电视画面到电视屏幕容纳电视画面图像窗口的部分，则掩膜和菜单图像可能被用以覆盖不需要的频道电视图像部分。 这种

掩膜技术允许分割屏幕电视画面保持在屏幕的同一位置， 并被操作中心 202 所传送。 然后， 掩膜经调整而覆盖屏幕期望的部分。 这些掩膜存在于背景图形文件中， 此文件与其他的菜单文件近似。

分割屏幕电视图像技术也可以用于促进电视节目安排。 因为很大数量的短电视连续地发送， 全部或部分的宣传资料（或信息供应）可能提供给节目预订。 以这些大量的宣传性电视图像， 订户得到机会去 " 扫掠 " 新的影片或电视节目的选择。 订户可扫视一种又一种的宣传画面， 直到发现所期望的节目为止。

C、 详细的先进的机顶终端说明

1、 概述

本发明涉及前面所述的机顶终端的升级， 具体来说， 本发明可以通过一组硬件升级装置， 或对以下一些实施例增加硬件来实现：（1）一个用快速电路板插件 700 将升级了现有的机顶转换器（未画出）；（2）一个工业标准的数字压缩码解码器箱（如下面的图 9a 和 9b 所示）它可以通过一个升级模块或一个菜单产生器插件而被升级；或（3）一个既能压缩码解码又能产生菜单的机顶终端 200。 利用以下描述的一组硬件升级装置能够对这些实施方案增加先进功能和作用。

表 A 表示了几个示例的硬件结构， 它们可用于达到本发明的目标。具体来说， 表 A 显示了四例机顶转换器技术， 它们可以被改进来产生该表三行中所示的各种机顶转换器能力。

表 A

	现有的模拟机顶转换器	具有数字码压缩码解码能力的机顶转换器	具有数字压缩码解码和菜单产生能力的机顶转换器	先进的机顶终端
压缩码解码能力	不适用	内装的	内装的	内装的
菜单产生能力	快速电路板	升级模块或菜单产生器插件	内装的	内装的
先进的功能	A—C 级的硬件升级或扩展电路板	A—E 级的硬件升级或扩展电路板	A—E 级的硬件升级或扩展电路板	内装的

这个图表示了每个机顶转换器固有的各项功能，以及需要时， 每个转换器可以怎样进行改进或升级，以达到本发明的目标。 自左至右，图表的这些列覆盖了各种可选择的办法来比较可以被建造在机顶转换器或终端方面的功能特性以及那些可以通过例如本发明的一个升级模块扩展电路板插件或硬件升级装置提供的性能。 这种比较权衡允许机顶转换器设计师或制造商对一个现有的转换器箱增加先进的功能还是生产一个具有附加固有特征的转换器之间作出选择， 后者增加了成本和转换器或终端的杂性。

表 A 表示一列显示了一个现有的模拟机顶转换器怎样能通过利用加速电路板插件被改进来提供产生菜单的能力， 除了加速电路板插件外，这样一个现有的模拟机顶转换器通过利用 A 级、 B 级和 C 级硬件升级装置或一个扩展插件被进一步改进提供以下描述的任何一个行进的功能。这种现有的机顶转换器箱当前由亚特兰大科技（Scientific Atlanta）和通用仪器公司（Gereral Instruments）及其它一些公司制造。 这些转换器设计成与模拟波形一起使用的， 因此， 数字压缩码解码能力是不适用的。

A 表的第二列显示了具有数字压缩码能力的机顶转换器， 这种转换器是一个简单的、 最终会成为行业标准的压缩码解码箱。 对这种简单的压缩码解码箱可以进行改进， 以提供本发明以增强的功能特征。 例如，可以通过利用一个升级模块或菜单产生电路板插件改进一个简单的解压缩箱以提供产生菜单的能力。 此外， 通过包括任何一个 A 至 E 的硬件升级装置或一个扩展电路板插件， 可以增加一个简单压缩码解码箱增加其他的先进特征， 这些改进在下面有所描述。

A 表的第三列显示了一个具有内装的数字压缩码解码和菜单产生功能的机顶转换器， 于是， 为了取得本发明增强的功能特性， 可以通过硬件改进提供其它先进的功能。 这样的改进通过利用任何一个 A 至 E 级的硬件升级或扩展电路板插件来实现， 它们将在下面有所说明。

A 表的第四列显示了一个具有压缩码解码、 菜单产生和先进功能的先机顶终端， 各项功能都被内装的终端里面， 这样就可达到本发明机顶终端的先进功能特性而无需硬件的改进。

在优选的实施方案中， 本发明先进的机顶终端 220 具有接收来自网络控制器的分层的节目编排， 分层节目编排允许不同的订户即使在被 " 调整 " 到同一频道时也能观看不同的影像。 例如， 网络控制器 214 会通过一个数据库从一个互动或选择中或从其它手段，由一些先前的订户选择， 通过 " 学习 " 知道它订户的一些统计资料。 利用这些统计资料， 该网络控制器 214 可以通过将不同的广告宣传显示给分类不同的订户而将广告宣传对准观众， 即使订户会认为他们被 " 调 " 到一个频道时， 每一个订户会被转换到该分层视频影像的一个不同的通道上。 作为另一种选择， 可以给订户提供可以从中选择的几个广告的附加选择。

为了适应讲外语的订户， 可以提供多声音通道的电视节目。 这样，订户可以看到利用其本国语言的节目单。 与这种被选语言对应的先取正确声音的功能可以根据结构而由机顶终端220，或者由网络控制器214处理。 网络控制器 214 可以提供以几种语言的播放本地节目或在受欢迎电视节目提供附加外语翻译频道。 利用画面对画面的功能， 某些机顶终端 220 可以同样方式供聋人观看的手语。

一般而言， 每个视频图像信号与四个声音通道一起在机顶终端 220 被接收。 这些声音通道中两个最用于正在显示视频图像信号的左、 右立体声， 其余两个声音信号可用于供选择的语言。 例如， 当机顶终端 220 接上一个视频图像信号时， 声音通道中二个用英语提供该视频图像信号的立体声， 其它两个声音通道提供法语和西班牙语的单声道声音信号。 这样， 在机顶终端 220 处接收到的每个视频图像信号能够

容纳至少两种外国语言。 在不要立体声通道时， 英语声音通道可以设置成单独一个信号， 提供单声道的接收， 并使多种语言声音通道的能力增加到三种外国语言。

在另一些实施方案中， 网络控制器 214 可以起中央计算机的作用，并通过机顶终端之间的互动式游戏，机顶终端内的互动式游戏，计算机告示板型式的服务，消息传送服务（电子邮件）等。 例如，一个订户可以与五个（不知名字的）订户各在自己家里操作一个独立的坦克， 进行战争游戏。 网络控制器 214 经由机顶终端 220 的通讯聚集这些游戏者并起裁判的作用，一个告示板或消息传送系统可以被建立起，来让戏迷们讨论某个特定的节目。以下会进一步描述这些互动式特征在下面与动互服务 B 级菜单和机顶终端硬件升级压缩技术。

为了取得系统所需的视频和声音信息的通过容量， 采用了视频数字压缩技术。 因此， 机顶终端 220 一般必须对它接收到任何一个以数字方式压缩了节目信号进行压缩码解码。 压缩码解码方法是用于节目发送系统中压缩技术的一个功能。

有三种基本的数字压缩技术：帧内压缩、帧对帧压缩、及载波内压缩。各种压缩方法可与这些技术一起使用。本领域内的专业人员知道这样一些压缩方法，它们包括矢量量化法和离散余弦变换法。

已经开发形成几种既代表数字化标准又代表压缩标准的标准数字格式。 例如，JPEG（联合照相专家组）是一个用于单独像片数字化的标准。 电影数字化可以由 MPEG 或 MPEG2（影响工程组规范）这样一些标准来表示，除了这些标准外，已发展出了另一些专用的标准，虽然在本

发明中优选使用影响的 MPEG 和 MPEG2 标准， 但可以利用可靠的具有压缩的数字格式。

几家公司，包括美国电话及电报公司（AT＆T），天顶公司（Compression Labs.），通用仪器公司（General Instruments），亚特兰大科技公司（Scientific－Atlanta），菲力普公司（Philips）和天顶公司（Zenith）已经发展出上述各种压缩技术和方法的混合。 任何一种由这些公司开发的压缩技术以及本领域专业人员知道的其它技术都可以与本发明一起使用。

2、先进机顶终端的主要部件和升级装置

a、具有升级模块的压缩码解码箱

优选的节目发送系统利用数字压缩信号，因此，优选的订户设备的结构必须能够对这样的数字压缩信号压缩码解码和进行处理。 图 9a 表示了在一个升级模块 300 和一个简单的压缩码解码箱 302 之间基本的相互关系和作用，升级模块 300 可以通过类似于前面叙述的升级口 662（图 5b）的一个端口被连到压缩码解码箱 302 上。 所示的这个简单的压缩码解码箱 302 最好是一个能够与一个升级模块通讯以加强功能特性的一个未来的工业标准的压缩码解码箱。

该升级模块 300 对该简单压缩码解码箱 320 提供产生菜单的能力。该简单压缩码解码箱 302 的微处理与升级模块 300 中的微处理器通讯以提供一个机顶终端完备的功能特性。

在该优选的实施方案中， 多金属缆可以利用引线脚连接将该简单压缩码解码箱 302 连接到升级模块 300 上。 这种多引线脚的连接可以

在从 DB9 至 DB25 的范围中。 也可以提供一个 SCSI， 或小型计算机系统界面， 端口（图上未示出）。 作为另一种选择， 可以提供四个或更多个端口，而不是所描述单独的一个端口。如果没有提供一个端口，则升级模块只好用硬线连到该简单的压缩码解码箱 302 上了。

如总的是用 304 表示的那样，简单压缩码解码箱 302 输出导线上的数字数据组最好向升级模块 300 输出误差已被校正和解密的数据。 第二组导线提供该接口的连接，它们使得升级模块 300 中的微处理器能与该简单压缩码解码箱 302 可以维持同步。 第三组导线提供解缩的视频输出，给升级模块 300 提供一个压缩码解码的视频信号以供操作。 第四组导线包括视频输入系统，使得该简单压缩码解码箱 302 能接收一个结合了文字内容、图形和视频信号的视频信号。

图 9a 进一步显示了作为该简单压缩码解码箱 302 组成部分的 CATV（电缆电视）输入 306， 视频输入 308 以及视频和声音输出 310， 312。这个实施方案降低了升级模块 300 的部件成本， 所以它是一个优选的方案。这个升级模块300可以只是一个能够插入该简单压缩码解码箱302的盒子（图上未示出）。 另一个选择是如图 9b 所示， 图上与有图 9a 共同的参考编号，电缆电视输入 306， 视频输入 308 以及视频和声音输出 310， 312 可以包括作为升级模块 300 的组成部分。在这一实施方案中， 该简单压缩码解码箱 302 主要用于视频进行压缩的解调。

参照图 10，升级模块 300 最好包括以下电路：一个视频图形和文字信号分离器 314 一个文字与图形的视频图象平面组合器 316；一个扫描宽度图形解压缩箱 318；和一个扫描宽度的被压缩图形的存贮器 320（非

易失性随机存储器、只读存储器、电可编程序只读存储器或电可编可擦程序只读存储器）借助于通过升级模块 300 和简单压缩码解码箱 302 之间多导线连结的通讯，被压缩的视频信号与控制信号可由升级模块 300 中的信号分离器 314 被分离。扫描宽度图形解压缩 318 通过与扫描宽度压缩图形随机存储器 302 的通讯，能对输入的压缩视频信号进行压缩的解调。文字内容和图形的视频图像平面组合器 316 使得被分离的和解压缩后的信号通过该简单解压缩箱 302 被输出到一个订户的电视机 222 上， 显示视频图像以叠在其上的具有文字内容的节目单。

图 10 显示了一个具有上述升级模块 300 的简单压缩码解码箱 302 的元件（与图 4 所画出的机顶终端的元件 220 具有共同的编号）， 生成的菜单和视频图象在组合器316中结合，并输出一个反录编码器619，任何一个本领域的专业人员所知的反录编码方法都可以与本发明一起使用。

图 10 还显示说明了一个扩展电路板插件 320 和一个用于接收该插件 320 的扩展件接口 320， 此外， 还显示了误差校正电路 324， 在分离压缩码解码的信号之前， 接收该信号。 升级模块 300 这种加强的功能特性或者也可以被包括在扩展电路插件 320 上， 在这种实施方案中，升级模块 300 成为该简单压缩码解码箱 302 的一个内部部件， 并通过内部的方式使该箱 302 升级， 在不用外部硬件升级模块 300 的情况下增加产生菜单的能力。 升级模块300 结构的其它变型也是可能的。

b、 上游数据传输硬件

图 11 显示包括一个数据接收器 332 和一个数据发送器 344 的优选

机顶终端 220。 数据发送器 344 在机顶终端和电缆始端装置 208 之间提供向上游的数据通讯，上游数据传输利用上面参照图 7a 和 7b 描述的询问系统实现的， 具体来说， 是利用一个数据发送器 334。接收器 332 与发送器 334 二者都可以装在机顶终端 220 本身里面或者通过一个升级模块 300 被加入。 不论具体的硬件结构形状如何， 机顶终端的数据发送能力可以用图 11 所示的硬件实现。

图 11 显示了在 330 处画出的射频信号，它们一起工作的接收器 332 和调谐器 603 接收。 这两器件都与微处理器 602 接口， 微处理器 602 或者通机顶终端的键盘板 645 或者通过遥控单元 900 接收来自订户的以 338 表示的输入。 调谐器 603 取得要在订户电视机上接收的所有电缆信号， 然后由处理电路 340 处理这些信号。 这个处理电路 340 一般包括用于解搅频、解调制、 音量控制和重新调制到频道 3 或 4 的电视载频上的附加部件。

以各个机顶终端 220 为目标的数据按照每个机顶终端专门的地址或认别号（例如机顶终端号 928，928）由数据接收器 332 接收， 这样每个可寻址的机顶终端 220 只接收它自己的数据。 数据接收器 332 可以接收结合图 7a 描述过的节目控制信息信号帧里情报资料段中机顶终端的专门数据， 或者在一个位于进来频谱中的一个方便的频率上一个单独的数据载频上的机顶终端专门数据。

任何被接收的数据包括与频道及可以选择的节目的有关的信息。 订户可以利用键盘板 645 或遥控器 900 输进一系列的命令， 以选取一个频道或节目。 收到命令后， 机顶终端的微处理器 602 指示调谐器 603

调谐到所指定频道或节目的适当频率上， 然后指示处理电路 340 开始对这个频道或节目进行搅频。

对一个频道或节目的选择作出后， 微处理器 602 将任何选择的资料贮存在一个本地存贮器中用于在以后数据传送回到电缆端头装置 208。 在典型的情况下，数据发送器 344 在 5 至 30 光赫之间的返回频段工作，数据发送器 334 向电缆端头装置 208 或网络控制器 214 发送参照图 7b 描述的帧的信号段中的信息。 本领域的专业人员知道， 上述机顶终端 220 硬件组成部的一些别的型式及组合可以用于实现上游数据传输。

c、 硬件升级装置

为了增强机顶终端 220 的功能特性， 可以利用以下的硬件升级装置：（1）A 级互动式装置，（2）B 级交互式装置，（3）具有光盘能力的 C 级交互装置，（4）供个别的房间使用的 D 级数字无线电调谐器，和（5）E 级信息卸载装置，这些升级装置的每一个都是通过前面描述过的升级端口 662 与机顶终端 220 连接的。

A 级、 B 级和 C 级硬件升级装置具有相似的硬件组成部分， 图 12a 示意图画出了总体以 100 表示的 A 级、B 级和 C 级硬件升级装置的基本部件， 这些图表示了在硬件升级装置 100 和机顶终端 220 基本部件之间的相互作用， 如从图上可看出的那样有线电视输入信号利用一个调谐器 603 和各种前面描述过的接收机部件（但在图 12a 和 12b 中总的用 601 表示）由机顶终端 220 接收。 机顶终端的微处理器协调所有有线电视信号的接收， 并与前面已描述过的各种各样的上游数据传输部件 604

相互作用。

A 级、B 级和 C 级硬件升级装置 100 各包括一个微处理器 104，互动软件 106， 处理电路 108， 磁泡存贮器 112 和长期存贮设备 116， 除了这些基本部件之外， B 级硬件升级装置利用了一个增加的电话调制解调器 120， 而 C 级硬件升级装置利用了一个增加的激光盘一只读存储器设备 122。

与它们的基本部件一起， A 级、 B 级和 C 级硬件升级装置 100 利用它们自己的互动软件 106。 这种软件可以用来提供以下将要描述的增强功能特性。A 级、 B 级和 C 级硬件升级装置还利用处理电路 108， 它使得机顶终端 220 能够将订户的互动输入送到 A 级、 B 级和 C 级硬件升级装置中进行解释。 这些命令经过将机顶终端的微处理器 A、 B 和 C 级硬件升级装置 100 中的微处理器联系起来的界面传送。 这样， 通过机顶终端键盘板进入的订户输入信号能够被传递到任何一个硬件升级装置中进行处理， 在那里产生的响应可以随后被送回到机顶终端 220 用于显示。在优选的实施方案中， 该 IR 命令从机顶终端被传递到硬件升级装置。

A 级、 B 级和 C 级硬件升级装置 100 还包括一个长期存贮器部件装置 116， 允许每个硬件装置在内部贮存与每个互动服务一起使用的数据。 这样一些数据可以包括例如由各个互动服务使用的定制的菜单模板。 此外， A、 B 和 C 级硬件升级装置包括了一个用于暂时贮存例如用于每个特定互动问题和应答的磁存贮器 112。

A 级互动装置使得订户能够取得互动服务， 提供有关诸如小测验猜

谜、 地理事实回答等节目的附加信息。 这种信息可以以几种数据格式由机顶终端接收，包括利用垂直消隐间隔（VBI）或节目控制信息信号的方式。 A 级互动装置使得订户利用叠在图象上的菜单能够对当时电视节目以文字内容方式产生互动作用。 小测验、 快速提供常识问题、 以及深入信息、世界地理位置、产品价格等是其中一些例子，所有这些都提供订户一个互动性的问题和回答的能力，虽然 A 级互动能力能够容易地装入到机顶终端220中，但这样一个实施方案提高了基本机顶终端220的成本。

B 级互动装置给用户提供取得各种用途的联机数据库， 如在家购物、 订飞机票、 新闻、 金融服务、 分类广告、 在家里的银行服务和互动式远距离教课服务。 例如， 用这种升级装置， 一个用户将能够预订机票或购买消费电子产品。 这种升级装置的基本特征是它能在调制解调器上利用双方通讯与外界服务进行真正的交易。 这种增加的双向通讯能力可以用电缆端头装置或另一方面， 经由蜂巢网络， PCN 或其它通讯媒介。

C 级互动装置利用一个高容量的本地存贮能力，包括激光盘或其它随机存取的数字数据格式（例如激光盘一只读存储器）。 这种装置允许利用互动的多种媒介的应用。 这些应用包括例如计算机游戏， 多种媒介的教育软件， 百科全书， 其它参考资料（如莎士比亚文库）等。 在该优选的实施方案中， 许多这样的应用将与现场节目播放产生互动作用， 提供附加的信息资料， 馈送的互动作用性。 例如， 一个在看外国电视片系列的观众能够检索贮存在光盘中的附加情报资料、地图、经

济数据以及关于这个国家的其它资料。 在 C 级应用中， 升级硬件会通过一些附加的数据频道（如垂直消隐间隔， 或在实际中视频中被编码的其它数字数据）密切地监测电视广播， 提供与前后内容有关的互动作用。

图 12b 画出了在机顶终端 220 与总的用 130 表示的 D 级硬件升级装置之间的互动作用。 如图所示， 有线电视信号经过调谐器和接收机部件 601 上机顶终端 220 接收。 如前所述， 微处理器协调、 机顶终端 220 对所有电缆电视信号的接收。 D 级硬件升级装置 130 利用一个微处理器 132， 一个调谐器 134， 一个解调器 136， 一个信号分离器 138，一个译码器 140 以及一个声音压缩码解码器 142。

如图所示， 机顶终端 220 和 D 级硬件升级装置 130 通过联接各个设备的界面相互作用。 机顶终端的微处理器 602 指示地被接收到的信号输到 D 级硬件升级装置 130 中进行进一步的处理。 这些被接收到的信号输入到 D 级硬件升级装置， 通过包括调谐器 134 和其它数字声音接收部件（如解调器 136， 信号分离器 138， 译码器 140 和声音压缩码解码器 142)的信号通路被传送。通过利用如图 12b 中结构的硬件，订户能够选择收听一个数字声音节目。 该订户能够通过一个可以在机顶终端 220， 也可以在 D 级硬件升级装置中的订户界面实现这样的选择。

D 级硬件升级使订户能够在其它节目（不一定是无线电）正在电视机上观看的同时取得这些数字无线电频道。 一般而言， 这种升级装置用于在与电视机分开的单独一个房间使用数字无线电。 该升级装置有一个单独的调谐器， 压缩码解码器和视觉显示器。 在这个优选的实施

方案中， 提供一个第二遥控器（它最好是以下要描述的机顶终端的一个按比例缩小的型式）以获得该数字声音系统。 这个遥控器配备一个显示器。

E 级硬件升级装置允许从操作中心 202 或电缆端头装置 208 卸下大容量的信息。 E 级硬件升级装置使订户能够将书本和杂志卸到存贮单元（例如硬盘、 软盘、光盘、 或磁带盘）。 最好该升级装置具有一个小的便携式， 称为 " Every Book " （注册商标）的阅读器使得被卸下的文本不需利用电视机就能被阅读。 这种便携式阅读配备有一个屏幕。

可卸载的信息可以是由操作中心 202 或电缆端装置 208 提供的文字内容或视频图像。 用这种升级装置书本以被压缩的形式贮存供以后压缩码解码用。 这种视频只有在观看时才被压缩。 公众希望马上取得的重要文字内容可以通过这种系统获得，像总统讲演、一个新的法律、或由最高法院作出的最新的堕胎决定等的文本就可以马上取得。

利用更高级的端口像 SCSI 端口， 多个硬件升级装置可以被连接或菊花式链接在一起以便同时工作。虽然这些升级装置被单独地描述，但它们可以被组合到或建在该机顶终端 220 内部。 本领域的专业人员知道这些机终端硬件的组合和补充的其变型。

d、 扩展插件槽

为了提供最大可以的灵活性和防止一个机顶终端 220 在终端的使用寿命期间成为落伍， 优选的实施方案中已装入了附加电子线路扩展插件槽。 如图 5b 所示， 扩展槽 665（在图 5b 中以虚线表示的）由金属盖板 664 盖住。 预计对某些用户特征会需要附加的存贮器或性能并在

电缆传递系统的容量增加时用于更新系统。

除了提供增加的存贮容量外， 扩展插件槽提供一个方便的更新该机终端硬件的方法。 具体来说， 扩展插件可被用于在内部提供上面讲过的 A 级到 E 级中任意一个硬件升级装置的特征。 但是这样一些实施方案利用了也是在前面描述过的上游数据传输硬件（或内装或调制解调器）。

从功能上来看， 扩展插件（未示出）可被插件一个扩展插件槽 665 中， 使在扩展插件上的连接器与机顶终端 220 上的连接器连接。 机顶终端的机身最好有一个架子或导轨来保持住该扩展插件。 在机顶终端 220 上的连接器可以就是到机顶终端 220 的微处理器和 / 或存贮器设备的电连接。 作为另一种选择， 在扩展插件和机顶终端 220 之间的接口可以是允许机顶终端 220 的存贮器资源能够直接扩展的电总线。 在这种情形下， 扩展插件本身包含了扩展机顶终端 220 可以取得的节目信息或数据量的存贮设备。 这样一些存贮设备包括 RAM， ROM， EPROM 或 EEPROM。 此外， 该接口可以是以单独一个存贮位置居于机顶终端 220 中的一个邮箱。 这种实施方案有利于在机顶终端 220 与扩展插件之间无论是以串行或行的格式传递数据， 这种传递由机顶终端的微处理器 602 协调和控制。

利用扩展插件在提高机顶终端潜在功能特性的同时， 降低了本身的成本。 于是一个扩展插件可以包括作为升级模块组成部分的增强的功能特性， 并且可被设计成提供与机顶终端 220 兼容的任何硬件升级线路。

3、 遥控器和机顶终端的订户入口

订户能够利用一个遥控器 900 通过机顶终端 220 取得系统播放的电视节目。图 13a 显示适合于这种取得节目用途的一个二段式遥控器 900。为了降低成本和尽可能增加机顶终端的用户友好性， 可以在一个诸如 Jerrold RC 560 这样的标准电视遥控器 350 上增加一个新部分 352 以提供附加的数字节目单和节目选择功能。 图 13a 画出了进入增加部分和对遥控器 900 光标移动的控制。

遥控器 900 具有一个设定按钮 354 和向四方移动的光标 356， 包括一个启动（Go）按钮 358 和节目单选取按钮 360。 优选的遥控器 900 用红外线（IR）信号工作， 信号由机顶终端 220 前部的红外感器 630 接收。

在最简单的实施方案中， 遥控器 900 可以做成只有光标运动按钮和 "启动" 按钮， 在更精密的实施方案中， 遥控器 900 可以具有一些可以编程执行一些特定功能的按钮用于一系列的输入。 一个智能的或灵巧的遥控器 900 既增加机顶终端 220 系统的成本， 又增加其功能特性。 利用图 13a 画出的一个扩增的遥控器 900， 订户就能浏览机顶终端 220 的节目单系统。

图 13b 显示了另一个用于本发明中的遥控器 900 的优选实施方案，可以利用光标的电视接收转换控制开关按钮 362， 包括音量控制、 频道选择， 电源和信号源按钮， 以及别的包括光标运动， 光标选择， 菜单选择和付费电视按钮在内的节目单按钮 364。 这些按钮不同于图 13a 所示那样沿宽度向分开， 是沿纵向安排在遥控器 900 上的。 在标准电

视遥控按钮 362 与节目单按钮 264 之间， 按钮的颜色或背景颜色可以不同以便一看就知道这两组按钮之间的区别。

遥控器 900 的宽度和厚度要比其长度小得多，使它方便地拿在使用者的手上。 遥控器 900 最好使它的重心平衡在十分接近长度方向的中间。 这种平衡使得用户在拿起它时大拇指自然地放在遥控器 900 的中间部位。

由于遥控器 900 的重心位于接近其长度的中间（因而使用户的姆指自然地放在同一个中心区域）， 用户最常选按的标志遥控按钮 362 和和节目单取得开关或按钮 364 设置在用户姆指容易到达的遥控器 900 的中心区域。 频道和音量增减按钮 366 被放在接近这个重心和纵向中心线的地方。 频道按钮 366 最好做成以相反的方向倾斜使得用户不用低头看遥控器 900 就能感觉到和按下一个需要的按钮。 同样地， 音量按钮 368 因为相同的原因最好也做成以相反的方向倾斜。 此外， 频道按钮 366 可以具有一个与音量按钮 368 不同的表面质地，以便更容易地区分。

光标移动按钮 370 和一个 " 启动 " 按钮 372 也放在用户姆指容易达到的长度中心区域。 " 启动 " 按钮 372 挑选一个与光标布置相对应的选择， 不用按钮的话，可以利用一个操纵杆，在杆上有一个选择，或者有一个可以压下跟踪球用于挑选所用的选择。 光标按钮 370 以 90 度分开设置，" 启动 " 按钮 372 如图 13b 所示位于光标移动按钮 370 中间。 光标移动按钮 370 以 90 度分开设置，" 启动 " 按钮 372 如图 13b 所示位于光标移动按钮 370 中间。 光标移动按钮 370 最好是朝着 " 启动 " 按钮 372 向内倾斜， 而 " 启动 " 按钮 370 被凹下去低于光标移动

按钮 370 的水平，使得在按光标移动按钮 370 时不会意外按下它。 除了光标移动按钮 370 上的倾斜外，这些按钮还可以具有一使用户不用低头就能感觉和选择适当按钮的表面质地，而且为了同一目的，在光标移动按钮 370 的表面上可以凸起或凹下有方向的箭头。

节目选择按钮 374 如图 13b 所示被设置在按钮 370 附近。 节目选择按钮 374 最好是遥控器 900 上最大的一些按钮。 节目单选择按钮 374 最好在其顶端表示上或在相应按钮的附近刻印图或其它图示。 例如代表体育的按钮可能有一个棒球图示。 插图表示了通过这个节目单选择按钮 374 在所选取的具体主要节目单上可以取得的播放节目。 这些插图也可以凸起于节目单选择按钮的水平之上以提供一个有特征的表面质感。 这种有特征的表面使用户能凭感觉来选择适当的节目单按钮 374，而不用看遥控器 900。 这些插图要在质地上明显不同， 但又要提供与相关节目单有联系的一个有意义的图像。

如图 13b 所示， 对以下主要的节目给出了标记和插图：电影、 运动儿童节目、 记录片 / 新闻、娱乐、 杂志、 节目指南、 高清晰度电视（HDTV）、 互动式电视、 音乐和一个用于其它节目播放的附加按钮 376。 节目单选择按钮 374 还可以对上述节目标以 A 至 J， 而用于所有附加的重要的节目的最后一个按钮标以 K 至 Z。

虽然遥控器 900 被描述成具有各种频道选择按钮， 但是标准遥控（部分的按钮 362）的几乎所有按钮都可被取消， 本发明使一个订户可以利用一个只有菜单选择按钮 374 和 / 或光标移动和选择按钮 370，374 的遥控器 900。

这里使用的 " 按钮 " 二字在构想时包括所有的开关方或接触灵敏电路来启用遥控器 900 中的特定功能。 此外， 虽然遥控器 900 借助红外传输与机顶终端箱通讯， 也设想了其它形式的通讯， 包括超声波、无线电频率和其它电磁频率的通讯。

4、 先进的特征和功能特性

a、 概述

在优选的实施方案中， 机顶终端 220 将包括一些现在正被本行业采用在的功能， 包括家长控制和锁定、 电子诊断和错误检测、 去除声音、 屏上音量控制、 睡觉定时器、 最近选择的提醒等， 每一个这样的特征有一个相应的菜单（或重叠菜单）， 它允许在屏上改制和起动该特征。

优选的机顶终端还支持一些先进的特征和功能特性。 这种机顶终端 220 使订户可以具有一幅接一幅的能力， 而不需要一个特殊的电视机来支持这一功能。 该机顶终端 220 还支持一个节目一览表的服务， 给订户提供有关在特定的订户位置可以得到的所有节目的信息。 机顶终端还包括向观众的能力以确定喜爱的频道、 个人概况、 收据和心情状态和资料、 机顶终端 220 还让订户观看以后节目的宣传片段的节目单。

机顶终端 220 用它的硬件升级装置来支持附加的功能特性， 这些升级装置使用户可以使一些其它的互动式服务， 例如参与联机的问答课程、 订货及确认飞机票订位， 和取得各种各样的其它情报资料服务。机顶终端利用一个数字调谐器作为硬件升级装置给订户提供数字声音的服务。

优选的机顶终端 220 用于控制视频录像机， 因而简化了节目的录制。 机顶终端 220 与节目发送系统结合在一起能够很容易地支持高分晰度电视（HDTV）。对于居住在边远地方的订户， 机顶终端适用于卫星天线接收系统。

除了所有这些机顶终端以它当前的内部编程和可升级特性之外， 通过对机顶终端的远距离重编程可以增加附加的特征或使已有的特征获得提高。 利用在只读存贮器固有的操作系统， 电缆端头装置 208 能够对机顶终端 220 的随机存取存贮器重新编程。 用这种能力， 电缆端头装置 208 就能够以远距离方式使机顶终端上的软件升级。

通过利用程序控制信息信号进行重新编程， 一些适当的信号在这个信号上被发送出去。 在另外一个方案中， 一个频道附专门用于这种专门编程需要。 在出现重新编程时， 电缆端头装置在这个程序控制信息频道上送出一个中断序列， 通知机顶终端 220 重新编程的信号将跟在后面。

b、 图像重叠的特性

虽然本发明的优选实施方案为观众一次为一个频道进行压缩码解码， 但是要求图像重叠特性的用户可获提供一个这样的机顶终端， 它具有能在任一时刻调谐和压缩码解码两个频道的升级硬件部件。 一旦取得两个信号， 机顶终端就能使图像重叠的特性被充分地取得而无需专门的电视机。

图 15 示意画出了实现图像重叠特性的一个方案。 这种实现方法必然需要两个调谐器 603， 603′ 和两个压缩码解码器 618， 618′， 使

得两个独立的频道节目可以同时显示在订户的电视机屏幕上。 如该图所示， 有线电视输入信号由机顶终端 220 接收， 输入到两个分开的调谐器中， 这些调谐器每个将调到一个独立的电视节目上， 这两个节目要同时显示在订户的电视上。 这两个电视节目通过图 15 所画出的两个并行的信号通路从有线电视输入信号中被索取。

每个信号通路本质上是一样的（因此它们的部件用同样的编号， 一个通路的部件编号带有一撇标记），所以只描述一条通路。 所画出的每条信号通路包括一个调谐器 603， 一个解调器 606， 一个信号分离器 609， 一个译码器 600 以及各种压缩码解码设备。 在各个信号通过这些设备时， 微处理器 602 协调信号的处理以产生一个译码的节目信号。译码后的节目信号进一步一边分为声音， 一边分为视频图形及文字内容。 节目信号通过一个声音压缩码解码器 612 被取出， 声音压缩码解码器进一步处理该声音， 以输出到订户电视机。

图 15 示意画出的实施方案显示了对于由各个调谐器调谐的每个视频频道只有单独一个声音频道。 如前所述， 声音频道的数目一般是单独一个视频频道对应四个声音频道， 这些声音信号中的至少二个可用于立体声电视放映， 虽然订户可以通过图像重覆的功能同时观看两个独立的视频图形， 但是订户的电视机一次只有接纳单独一个声音信号（或者对立体声接收二个声音信号）， 这样， 图 15 所示的机顶终端还必须包括一个开关（未示出）， 它提供在对应一个视频图像或另一视频图像的声音信号之间的简单转换。 这样一个声音转换器， 是本领域中公知的一个部件， 使得订户可以听一个图象或另一个图象的声音。 节

目信号的视频、图形与文字内容部分送到另一个信号分离器 314 中，它接着 信号所有的视频、 图形和文字内容分开， 这些信号部分被贮存在机顶终端 220 中的一个存贮设备 620 中。 这个存贮设备可以是一个只读存储器、 随机存储器、 电可编程序只读存储器或电可读可擦程序只读存储器。

微处理器 602 启动并协调这两个信号中每一个的视频， 图形与文字内容的压缩码解码， 一旦这些信号组成部分在机顶终端 220 中被压缩码解码， 这些分量就被送到视频组合器 316 中， 视频组合器将这两个节目信号的视频图象、 图形与文字内容联系并结合在一起。 视频组合器输出用于在订户电视机上显示的这二个节目信号。 这些信号也可以通过一个 NTSC 编码器 625， 以产生模拟的 NTSC 视频波形， 同样可以在订户电视机上显示。 这样的显示必定需要每个信号通过一个 RF（无线电频率）调制器 605 以便能输入到一个电视机中。 这样， 产生两个单独的无线电频率视频输出， 每个无线电频率由调制器产生的视频信号具有它自己相应的声音输出， 它们由每个声音压缩码解码器产生。

每个由这两个调谐器结构产生的视频信号（以及它相应的声音信号）能够同时被显示在订户的具有画像重叠功能的电视机上， 或者机顶终端 220 本身能产生供显示的画像重叠的图像。 这种显示涉及对其中一个视频（和声音）信号的定比例和重新定位， 使得产生的这两上图像能同时被观看。 这样做后， 订户电视机能够以合屏幕形式显示一个节目的图像， 而另一个节目的图像以缩小的比例被显示并重新定位来显示， 叠盖在该全屏幕的显示上面。 为了实现这样一种技术， 机

顶终端 220 必须包括产生一个画像重叠功能所必需的硬件组成部分， 包括能够定比例， 重新定位置和叠盖图象的硬件。 这样一种先进的机顶终端 220 允许订户甚至在其电视机本身不能产生这种效果的情况下能够利用画像重叠的功能。

c、 节目一览表服务

参照图 15 和图 8， 在本发明的优选实施方案中，列出了电视网计划中有的节目的节目一览表菜单 1100， 以 1020 所示型式的一个主菜单形式被取得。在优选的实施方案中， 该主节目一览表菜单 1100 还会提供一个次菜单， 像电视网未来七天的节目表， 今天未来六小时电视网的节目表， 及未来七天电视节目一览表精选等。

为了使机顶终端 220 能够提供节目一览表服务，该机顶级端 220 必须能接收有关的在其特定订户位置可以收看的所有节目的信息。 这种信息将作为节目控制信息信号或机顶终端控制信息流的一部分被送到每个机顶终端 220。 节目控制信息信号会包括以下七天的计划的所有节目和别的内容。 这种节目播放的信息会包括， 例如包括：每个节目的名称、 节目的类型、 节目开始的时间、 节目的长度、 节目播放的日期、该节目简要说明以及该节目是否有字幕等等。

所有与这种节目一览表服务一起使用的节目播放被送到机顶终端 220， 贮存在它的内部存贮器中， 一旦订户选取这种节目一览表服务，微处理器在其菜单编制和产生过程中访问该存贮器， 这样， 这些节目播放信息就与节目一览表菜单模板或分菜单模板相结合。 这种节目一览表服务可以涉及利用多于一张菜单， 特别是在电视网计划的信息超

过几天的情况下， 更是如此。

如果特定的机顶终端 220 已订有节目一览表服务， 订户进到一个显示节目时间表的次菜单。 如果订户选取这个电视网时间表次菜单 1102， 他就有一个电视网节目时间表的一览表供他挑选。 如果订户要选取。 例如 HBO， 那么一个 HBO 专门的次菜单（未示出）能够选择感兴趣的一天， 看看这天上播放什么节目。

d、 询问观众

为了支持各种各样的服务，机顶终端 220 能够向观众提出问题，并记录观众的答复。 例如， 机顶终端 220 为了在显示电视菜单 112 的图上 16a 上建立起一个用 1100 表示的喜爱频道的列表， 询问订户以及让订户输入他所挑选的 8 个喜欢的频道的菜单被显示。

在询问订户所喜爱的一系列节目后， 该终端显示一张次菜单， 允许订户选择一个他喜爱的或受欢迎的节目来观看。 虽然可以选择各种各样的菜单，但是每一个的目标是相同的， 一减少或增加印刷式电视节目指南， 在另一个方案中， 提供一个节目观看建议的特征作为一个附加特色， 这种特征给于那些犹豫不决的或懒散的观众以一些有关他应当看哪些节目的建议。 机顶终端 220 利用了一个相应的算法来建立这种节目的建议的特征。 这种节目建议的特征一份正在审查过程中的美国专利申请（流水号_____）中被详细描述， 该申请的名称是： " 电视节目发送系统推荐节目的可重编程序终端 " 。 该申请通过引用被结合到本申请中。

为了使机顶终端 220 对该订户指出应当看哪些节目而作出决定， 该

终端必须建立起该特定观众的一个个人的情况。 根据在特定观众个人情况中的资料以及在节目控制信息信号中取得的电视节目资料， 机顶终端 220 可以选择一组该特定观众可能观看的节目。

为了使这一特性能够运行， 机顶终端 220 能够收集每个观众的个人情况。 贮在一个存贮器文件中。 这种个人情况由以一些方式收集的统计资料组成。 机顶终端 220 对每个观众建立这种个人情况并按观众的姓名将这种信息贮存在一个存贮器文件中。 为了在一个优选的系统中建立一个人情况， 该观众回答在一系列菜单屏幕上出现的一系统问题。 这些个人情况的屏幕请示观众输入资料、 像姓名、 性别、 年龄、出生地、 低年级学校教育的地点、 职业类型、 教育水平、 每周观看电视节目的数量以及在一个星期中该观众观看特定种类的节目的数目，如体育、 电影、纪录片、 生活喜剧等， 可以利用任何有助于机顶终端 220 有针对性地向该观众做广告宣传或节目建议的人员调查资料。

一旦建立了个人情况（在一个特定的机顶终端 220)， 它可以在非易失性存贮器中无限地被贮存。在家庭菜单屏幕 1010（图 8）上的一个选择启动这种节目建议特征， 在要被启动之后， 机顶终端 220 会给观众显示一系列简要的问题， 以确定观众在该特定时刻的心情， 像在图 16b 上表示的那样。 例如，第一个心情问题的屏幕 114 可能要求观众选择他是否愿意看一个短的（30 分钟)、 中等的（30—60 分钟）或长的（60 分钟以上）节目， 第二个心情问题的屏幕 1116， 要求观众在系列节目中从思想性的节目和浅显易懂的节目之间作选择， 像图 16c 中所显示的那样。第三个心情问题的屏幕问用户需要一个消沈的节目还是

积极活跃的节目， 像图 16d 显示的那样。 观众利用在遥控单元 9000 上的光标移进动键和前键对每张提问菜单作出一个选择。

在观众对确定他心情的提问菜单作出答复之后，机顶终端 220 利用其个人情况资料， 找出适合该观众最好的播放节目。 机顶终端 220 提供几个建议的节目给观众。 以这种节目选择的特点， 机顶终端 220 可以用智能的方式帮助特定的观众选择一个电视节目。

个人情况的资料还可以用于有针对性的做广告宣传。 在优选的实施方案中， 网络控制器 214 能够把专门的广告有针对性地送到电缆分配网络的结点上， 或者送到各个订户。 为了实现寻找广告目标的能力，网络控制器 214 将许多套的广告发送到电缆分配网络的结点或各个订户， 供最终在机顶终端 220 上显示。 当观众正在观看的视频影象接近中断做广告信号。在这种处理当中， 微处理器 602 协调分离这种节目播信号。一旦视频图像信号暂停进行商业广告时，根据前述的个人情况资料， 一个特定的广告或一组广告有针对性地送到一个特定的机顶终端 220 上。 虽然网络控制器 214 是该节目递送系统中提供这种目标寻找能力的部件，但是机顶终端 220 被调到一个特定的频道， 但一个来自别的频道的广告却显示在订户的电视机上。

提供这种放行频道转换能力所需的硬件被显示在图 17a 和 17b 上。图 17a 显示了在单独一个 6 兆赫的频道带宽内提供频道转换的机顶终端的硬件组成部分。这些部件包括一个调谐器 603， 一个解调器 606， 一个信号分离器 609， 一个多路传输器 400， 一个压缩码解码器 622， 一个微处理器 602 以及一个本地存贮器 M。 调谐器 603 通过调谐到一个包

括被显示图象和一些携带广告的频道进行工作， 解调器 606 处理这些信号并将它们送到信号分离器 609 中， 将接收到的信转换成分开的节目信号和广告信号。 在这种处理当中，微处理器 602 协调分离这种节目播放信号。一旦视频图像停进行商业广告时，微处理器 602 指示多路传输器 400 选择该广告或一些广告送去解压缩， 并随后在订户电视机上显示。 这种硬件结构允许机顶终端 220 在 6 兆赫带内的频道之间作转换并为观众放映各种的广告， 而不论观众正在观看什么视频影象。

如果一个针对性的广告落在包含该观众正在收看的视频节目的被调谐的 6 兆赫频宽之外， 则利用图 17b 所示的硬件结构。 在这个结构中，就像图中由双向箭头所表示的那样， 微处理器 602 指示调谐器 603 重新调谐到另一个 6 兆赫的频道通道上。

微处理器 602 与调谐器 603 配合工作就能使在另一个 6 兆赫通带上发送的有针对性的广告以最少的截获时间和延迟被调到。 更具体地说，这种结构允许机顶终端可以调到一个给定的 6 兆赫频带的外面（到另一个 6 兆赫的频带中）以便选择为目标的广告来显示。 这种供选择的实施方案可能需要一个完全的屏幕屏蔽， 使得在调谐过程中产生的令人讨厌的屏幕跳动减少至最小。 屏蔽用于盖住不然会调谐到另一个 6 兆赫频带宽度的截获时间（例如 0．5 秒）中出现的闪烁。

如果截获时间或延迟太长的话， 一个可选择的方案（未画出）可以包括利用二个调谐器的结构， 以成本的增加换取更低的截获时间。本领域的专业人同会知道许多能提供一个放行频道转换的其它机顶终端硬件的结构。 在名为 " 有线电视传送系统网络控制器 " 的美国专

利申请(流水号_____)中提供了目标广告和频道转换更详细的说明，该申请通过引用被结合在本申请中。

e、 促销菜单

图 18 画出了在系统 200 中利用一个用于销售预约的服务的促销菜单 1120。 这种促销菜单被定在包括各种联机型服务的 B 级互动服务装置中。 服务有数据库服务、 电话薄信息服务和预订飞机票服务等。 类似的菜单也用于 A 级互动服务。 它还提供订户有关猜谜， 地理事实问答等节目的附加信息。 这种信息可以在几种数据方式中由机顶终端 220 接收， 包括在垂直消隐间隔（VBI）和在节目控制信息信号中。

类似菜单 1120 的其它一些菜单也可用于 C 级互动服务中， C 级互动服务利用诸如激光盘技术这样的本地存贮器（如 122）以提供很大范围的多种媒介的经验。 C 级互动服务如前所述需要一个硬件升级装置，CD－1 和 CD－ROM122 装置特别适合于用这种服务。

一般， 当订户选择一个非现有通道时会产生促销菜单， 形成一个虚拟的频道， 这样的虚拟频道不需要任何附加的频带， 因为这些频道并不携带产生一个促销菜单所需以情报资料。 当订户选择一个并不存在的频道时（例如频道 166）， 一个虚拟频道被产生， 以一些方式利用发送到机顶终端的数据。 例如， 数据可以被发送在另一个在波段外频的垂直消隐间隔（VBI）中， 或者该菜单信息从电缆端头装置发送在机顶终端控制信息（STTCIS）中。 利用这些数据产生就地贮存在机机终端处的以可以在订户电视机上显示的 NTSC 视频信号形式的图像。 这样，可以设立一个促含有菜单， 建立一个虚拟频道， 这种功特性就使机顶

终端具有显示一个促销菜单或图象显示的能力， 只要订户选择了一个不存在的频道。

f、 其它互动服务

图 19a 和 19b 显示了利用 A 级互动服务可取得的菜单（分别为 1130 和 1132）。 参照图 19a， 当一个电视节目可利用 a 级互动服务时， 系统会显示一个由字母 " I " 和两个交叉的具有半圆形尾巴的箭组成的一个交互标记。 在优选的实施方案中， 机顶终端 220 将这个交互标记像覆盖菜单一样放在电视机屏幕上。在这种优选的实施方案中，机顶终端 220 将检测是否有可以利用互动服务给订户显示的电视节目的数据或信息。 当机顶终端 220 检测到有互动信息可取得时， 它将产生这互叠菜单 1134 并将它放到电视屏幕上。 例如机顶终端将检测到， 关于一个电视节目的信息正在垂直消隐间隔（VBI）中传送， 并产生一个互叠盖菜单 1134， 以每十分钟的节目播放间隔时间出现在订户电视机屏幕上 15 秒钟， 类似地机顶终端 220 能检测到节目具有可利用接近于对白的文字说明以信息， 并将一个文字显示条置于屏幕上。

参照图 19b， 当订户在电视机屏幕上看到该互动标记 1134 时， 订户就知道可以利用与他收看电视节目相结合的互动服务。 如果该订户按下互动遥控按钮， 机顶终端 220 会产生另一个互叠菜单 1133 并将它置于屏幕上， 这个互叠菜单 1134 被显示在图 19b 上重叠在一个交互电视节目上面。 从这个菜单 1134 上，订户可以选择许多不同型式的与当前电视节目进行文字内容的相互作用像在 1134 上， 这些节目包括猜谜、事实问题更多的信息、 世界地理位置、 产品等等。在操作互动分菜单

期间的任何时候， 用户可以返回到该电视节目， 不必互动特性。

另一分菜单 1136 在屏幕下半部分以文字内容方式向观众提供与该电视节目有关的附加信息。 在图 19b 中， 分菜单 1136 显示可取得的分目录猜谜的互动选择。 在这处互动的分目录 ， 向用户呈现出一些问题和一系列可能的答案。 如果订户愿意的话， 订户猜谜选择一个答案， 在选择之后， 机顶终端 220 就依次到另一个菜单。 机顶终端 220 依程序以该交互猜谜答案分菜单， 它告诉订户是否选择了一个正确的答案。 接着， 另一个分菜单会显示正确回答的或不正确回答的猜谜问题。

图 20a 是 B 级互动服务的一个分菜单的例子。从这个分菜单 1141 上， 可以取得许多联机情报资料服务中的任何一个。在这张菜单上订户已选择了一个服务，即预订飞机票的服务。

在选择预订飞机票中， 订户遇到一系列有关联机情报资料服务的菜单， 参照图 20b， 通常给订户显示一张分菜单， 如分菜单 1144， 用于提供各种附加选择的情报资料务。 在每一张与一种情报资料服务有关的分菜单中， 订户能够出去， 回到主菜单 1010 或普通的有线电视。

图 20c 是航空公司信息和预订分菜单 1144，允许一个订户看 6 种尚有空位的航班。订户可以选择航班中的一个，看它否还可订座。另一个类似的分菜单允许订户输进希望能订座日期的年、月、日。在这种分菜单中， 提供给订户更正输入资料任何错误的选择性。

图 20c 是一张航空公司分菜单 1150， 它使订户可以查看一个航班中可取得的剩余座位， 使订户能够选择一个指定座位。 这张互动式分

菜单 1150 是如何利用菜单的一部分和不同颜色的办法向订户以图形方式显示信息的一个例子。 在这个互动式菜单中， 屏幕的下半部分显示一个飞机的客舱， 所有的座位位置用方块的图形方块的图形方式表示。通过用蓝色对已占位置著色和对未占的座位位置上著不同的颜色， 该菜单就能在有限的空间容量中提供详细的资料。 这种用在互动式联机情报资料服务中的信息图形表示法是向观众以视觉方式显示大量信息的一个重要的方法。

参照图 20d，另一张分菜单 1156 允许订户选择单程或双程机票，确认订座和用信用卡付机票款，在弊下部选择适当的条状菜单。 在这个特定的菜单 1156 中，订户正在用信用卡付机票款。别的分菜单可以处理订户机票的信用卡收款、确认订户对机票的购买，并将这种信息送到出机票的地方。

利用上述方法和硬件，可获得各种互动式服务。本领域的专业人员知道， 优选的机顶终端 220 可以采用这样一些互动式服务。

g、 致电者的认别

利用机顶终端和一个被联接的调制解调器的功能， 机顶终端能够执行辨认致电者的功能。 机顶终端辨认致电者的功能以与电话公司提供辨认致电者功能相类似的方式帮助观众。 但是机顶终端能够利用电视机作为它的显示方式告诉用户， 对这种辨认致电者功能更受欢迎和更感方便。

如果机顶终端 220 检测到一个观众正在使用该系统和观看电视， 这种辨认致电者功能会自动启通，辨认致电者启通时，机顶终端的软件通

过调制解调器监测向该观众打进来的电话。 在机顶终端检测到电话铃正在响时， 系统将自动查寻打进来电话的数据资料， 辨认致电者的电话号码。

基于收到了打进来电话号码， 辨认致电者的优选实施方案是将该电话号码与存贮器中的电话号码进行比较，贮存在存贮器中的电话号码与贮存的号码一致时， 相应的文字内容或图形被显示在电视机屏幕上。例如，＂外婆＂和＂一张笑脸＂的图形利用一个复盖菜单会闪现在电视屏幕上。

以这种方式， 观众可以看到致电者的姓名（和认别的插图图形）并能够决定启通自动电话消息记录系统或接电话。 在产生一个叠盖菜单后， 机顶终端软件等待发送观众反应的一个 IR 命令。 以简单按下遥控器上的一个按钮， 观众就能继续看节目并知道致电者的身份， 无需使他的视线离开电视机。 如果用的是一个无声电话信息系统， 观众可以就让电话铃响到必要的次数， 直到电话应答机正常启通并回答电话。

在另一个优选的实施方案中，不贮存电话号码，机顶终端可以只是在屏幕上利用复盖的菜单在屏幕上闪现打进来的电话机号码。在一个更高级的实施方中，在机顶终端或遥控中配备一个拾音器。利用电视机的扬声器，遥控器和拾音器，观众可以利用遥控器上的按键，眼睛不用离开屏幕的情况下接电话。

h、 数字音响功能

参照图 21，本发明的数字音响特征使订户可以通过订户立体声设备

（未示出）收听激光品质的音响。这可以通过用电缆直接从机顶终端 220（它可以包括一个 D 级硬件升级装置）接到订户的放大机 / 立体声系统实现， 或者订户可以通过其电视机收听音响。

在优选的实施方案中， 数字音响特性利用了一个 D 级硬件升级装置作为数字无线电调谐器。 这种 D 级硬件升级装置使订户能够利用该节目递送系统数字音响信号传输能力。 数字音响传输需要比传送一个数字视频信号低得多的频带。 因此， 在即使是有限的频带段上， 几百个数字音响节目能够被传送到每个机顶终端 220 上。

如果数字音响节目被递送到机顶终端 220 上，D 级硬件升级装置（示于图 13）给订户提供一张选择收听一个确定的数字音响节目的菜单。 D 级硬件升级器利用一个与机顶终端 220 为显示视频图像而采用的调谐器分开的调谐器 603。 数字音响信号经有电视传输媒介在机顶终端 220 处被接收。 机顶终端 220 转而又将该数字音响信号送到 D 级硬件升级装置的各个部件中去，这些部件可以包括一个调谐器 603，解调器 606，信号分离器 609，译码器，压缩码解码 622，遥控界面和微处理器 602。

D 级硬件升级装置利用它的调谐器 603 调到由订户选取的特定数字音响节目上，然后对数字音响信号进行解调、信号分离和译码。在完成这些处理后，该数字音响信号压缩码解码，产生一个处理好的数字音响信号，可以输出订户立体声设备或直接送到场声器。

D 级硬件升级装置包括一些数字音响信号输出的端口，提供信号从 D 级硬件升级装置传输到订户立体声设备的必要联接。此外，D 级硬件升级装置设备包括一些能显示被选择节目的频道号码、数据和时间等的

小型发光二极管（LED）显示器。

D 级硬件升级装置可以被实际放在电视机和机顶终端 220 不同的房间里，这样，D 级硬件升级装置就有它自己的遥器（未画出），具有比上述机顶终端遥控器 900 会更少的选择性和按键。 这种 D 级硬件升级装置比机顶终端遥控器 900 会更加有限， 因为 D 级硬件遥控器专用于数字音响节目的选择。 尽管如此，这种有限的遥控器包括一个用于显示所选数字音响节目的频道号的 LED 或 LCD（液晶显示器）显示器。 作为另一个选择， 机顶终端遥控器可被编程与 D 级硬件升级装置一起使用，从而无需另外的遥控器来利用数字音响特性。

无论用哪一种遥控实施方案，订户都可以进入 D 级硬件升级装置来选择一个数字音响节目。 遥控器发送一个红外命令信号给 D 级硬件升级装置， 指示该装置的微处理器 602 开始选择一个确定的节目。 所需的节目如前所述被处理（即被调谐、信号分离、译码和压缩码解码）并送到订户立体声设备听收。

选择一个数字音响节目不一定需要与订户电视机有交互的作用。 选择一个数字音响节目所需的一切通讯可以产生在遥控器与 D 级硬件升级装置之间。 因此，数字音响的运行不需要调谐订户的电视机。

另一个可能的选择是 D 级硬件升级装置与机顶终端 220 放在一起，订户能够通过订户电视机屏幕上显示的一张菜单选择一个音响节目。 在这种方案中，订户利用机顶终端的遥控器进入一张选择数字音响节目的菜单。

在一个供选择的实施方案中，机顶终端 220 包括了 D 级硬件升级装

置的一切特性，因而不需要升级装置。 本领域的专业人员会知道其它允许接收数字音响可替代方案。

图 21 是一张显示数字音响节目选择的主菜单 1160，付费的订户就会有这张菜单。 在图表格式 1162 中，主菜单显示了在六个不同音乐类目中最受欢前五首、十首、及四十首歌。 在图表下面，系统能提供描述被选音乐节目详细内容的文字消息 1164。利用同样的图标和菜单格式，系统能提供鼓励订户试验付月费参加该服务的文字说明。 例如， 一张菜单以锡费示范方式让订户试验这系统，另一张菜单允许订户请求一些有关这个系统的另外一些促销性资料。 这样的菜单可以在所有菜单系统中使用。 从任何一个用于数字音响特性的菜单屏幕上，订户可以按单独一个按钮，退回到普通的电缆电视。

i、 录像机控制

参照图 22，机顶终端 220 组成的先进系统被用于控制录像机和利用一个引导录像特性来简化记录节目。机顶终端 220 有一个用于录像机的单独输出。控制信号被传送经过机顶终端 220 的录像机输出， 输入到录像机，使录像机由机顶终端 220 自动控制。利用机顶终端 220，订户从菜单选择一些节目，而录像机会被自动启通记录被选取的节目。

为了提供录像机控制特性，机顶终端 220 向录像机发送指令或控制信号。 这样一些控制信号由机顶终端的微处理器 602 触发， 产生并利用一个单独的联接或者作为在订户电视机上显示的被处理好视频信号的一部分送到录像机上。 这些控制信号直接从该先进的机顶终端送到录像机， 指示录像机何时开始和结束对特定节目的磁带记录。

微处理器 602 协调送到录像机的控制信号的传播，将这样信号内容贮存在本地存贮器中。 一到接近该节目要放映的时间， 微处理器 602 启通菜单产生软件， 显示一张通知菜单或屏幕， 通知订户该节目接近放映时间了。 这种提醒也请订户检查是否已将一匣磁带插到录像机中。

订户可以通过进一张录像机控制菜单启通录像机控制特性， 录像机控制分菜单问订户是否希望录下一个选择节目供以后观看。 这样， 订户利用前面叙述过的提供订户互动式回答能力的任何一个硬件以交互的方式在菜单或屏幕上输进这样的信息。

在优选的实施方案中，订户可以利用一个与他的录像机或其它视频录像机连在一起的一个电影库。该电影库是一张可选取电影清单的菜单。 这样，一个订户可以录下一个电影库。 该电影库是一张可选取的电影清单的菜单。这样，一个订户可以录下一个在不方便的时间开始放映的电影供以后观看。 通过使机顶终端具有适当的特性，订户可以让该机顶终端启通电视机和录像机并执行录像机并执行录电影所必需的一切功能。

在触发了录像机控制特性后，一张菜单屏幕确认选择的电影，开始的日期和开始时间， 并通过该订户录像机将会自动被接通。 操作这张分菜单时， 用户通过按一个退出按钮可以退出回到电影库主菜单， 或退回普通电视， 或取消电影库的订约。 这种菜单显示订户已经选择了退回普通的电视。 订户的录像机或其它视频磁带记录设备必须被连接到机顶终端 220 上以进行自动录像。

紧接着一个节目选择之后， 电视机上出现一个节目说明菜单。 此

外， 根据这张节目说明菜单， 观众可以利用引导录像特性选择要在他的录像机上录下的选定节目。 如果选择了引导录像特性， 图 22 上所示的引导录像分菜单 1170 给订户进一步的指示说明。 为了将机顶终端 220 设置成执行录像的功能并操作录像机，控制信号经由机顶终端 220 和录像机之间一个单独的连接从机顶终端送到录像机上。 录像机能够解释这些从机顶终端来的控制信号并执行所希望的功能（像启通录像的特性等）。 在优选的实施例中， 如前所述， 录像机控制信号与输出端 650 输出的视频信号波一起发送。 另一个方法是利用机顶终端 220 与录像机之间一个单独的连接。

j、 高清晰度电视功能

优选实施方案的机顶终端 220 与节目传送系统能够容易地支持高清晰度电视（HDTV）。 数字视频图像、 压缩以及每个频道不受约束的频带限制的组合使得本优选系统十分适合高清晰度电视。 高清晰度电视更大的信息量对本系统不会产生任何问题。 优选方案的菜单选择系统是向订户提供高清晰度电视节目播放的一个受订户欢迎的方式。

图 23 显示了高晰度电视服务与产生菜单式节目传送系统的结合。如果订户选择高清晰度电视的主菜单 1032，订户会接到一个与订购该系统的一个建议一起的一个说明，或者接收到一个当场订购的文字注释和高清晰度电视中现在可取得的节目选择的一张列表。 如果订户没有付费参加该特定的服务， 即高清晰度电视， 则允许订户加入一个正在进行的节目一段时间为示范来诱使订户去订购该服务。

如果订户已付了高清晰度电视的费用，订户像以任何其它主菜单屏

幕一样作为开始。 这张特定的主单显示一个例子，表明这同一菜单的一个紧接着的或第二个屏幕可能会存在。在这特定的情况下，该主菜单高清晰度电视 1032 存在一个第二屏幕。订户可以通过在屏蔽下半部分中选择菜单显示块 1172 " 其它高清晰度电视选择 " 进入该第二屏幕。紧接着这种选择之后，订户就取得了节目选择的一个第二屏幕， 这样任何菜单能够具有许多节目选择的多个屏幕。这种在一个菜单上屏幕页面型操作中心 202 组装器避免了在该同菜单中对各种节目选择的分类。 在另一种实施方案中，随着订户向上或向下卷滚，菜单块中的文字内容随之改变。这个高清晰度电视例子的许多变化型式可以与所述的系统一起使用。

k、 后院卫星系统

在另一种结构里，在没有电缆服务的地区订户利用后院卫星系统（TVRO）接收配套电视服务，机顶终端 220 将包括适当的硬件使能通过端口 656 连接到卫星 206 接收设备上。在这种结构中，机顶终端 220 中的菜单系统直接作中心 202 进行编程。 此外，在订户家中必须设置一个上游通讯机构（即调制解调器）与操作中心进行信息的联系。

这些使机顶终端能在一个后院卫星系统中远行的硬件组成部分不被包括在机顶终端本身之中。任何这种使机顶终端 220 与后院卫星系统配合运行的部件往往是在订户屋外。因此机顶终端 220 将像前面所描述的那样工作，尽管在节目递送的传输媒介上发生了变化。

这里所用的术语和描述是为了示例说明，并不表示仅限于此。本领域的专业人员知道，在以下权利要求所规定的本发明的要旨和范围之内，可以作出许多的改变型式。

说 明 书 附 图

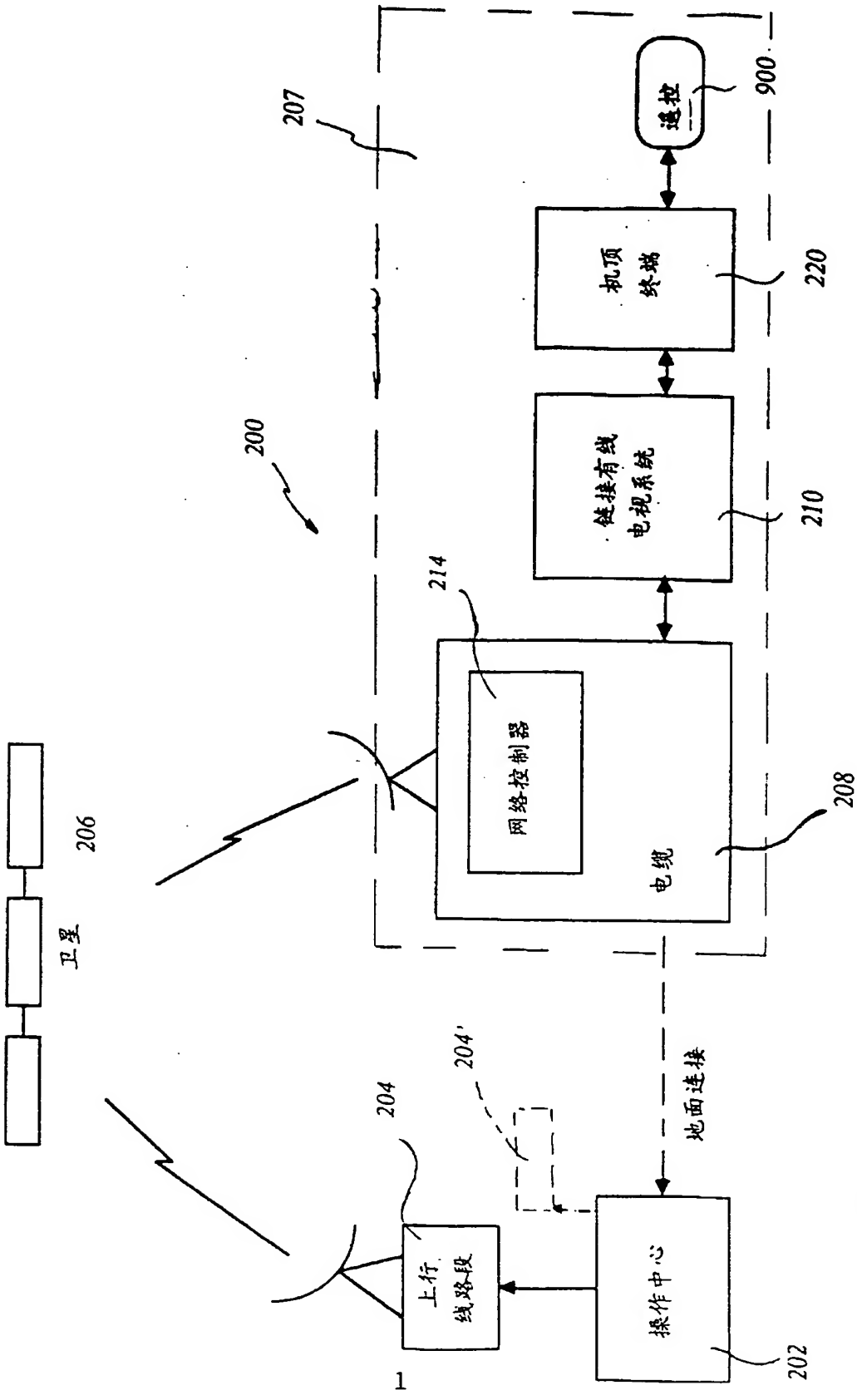

遥控
900
207
机顶终端
220
链接有线电视系统
210
200
214
网络控制器
电缆
208
卫星
206
204'
204
地面连接
上行线路段
操作中心
202

图 1

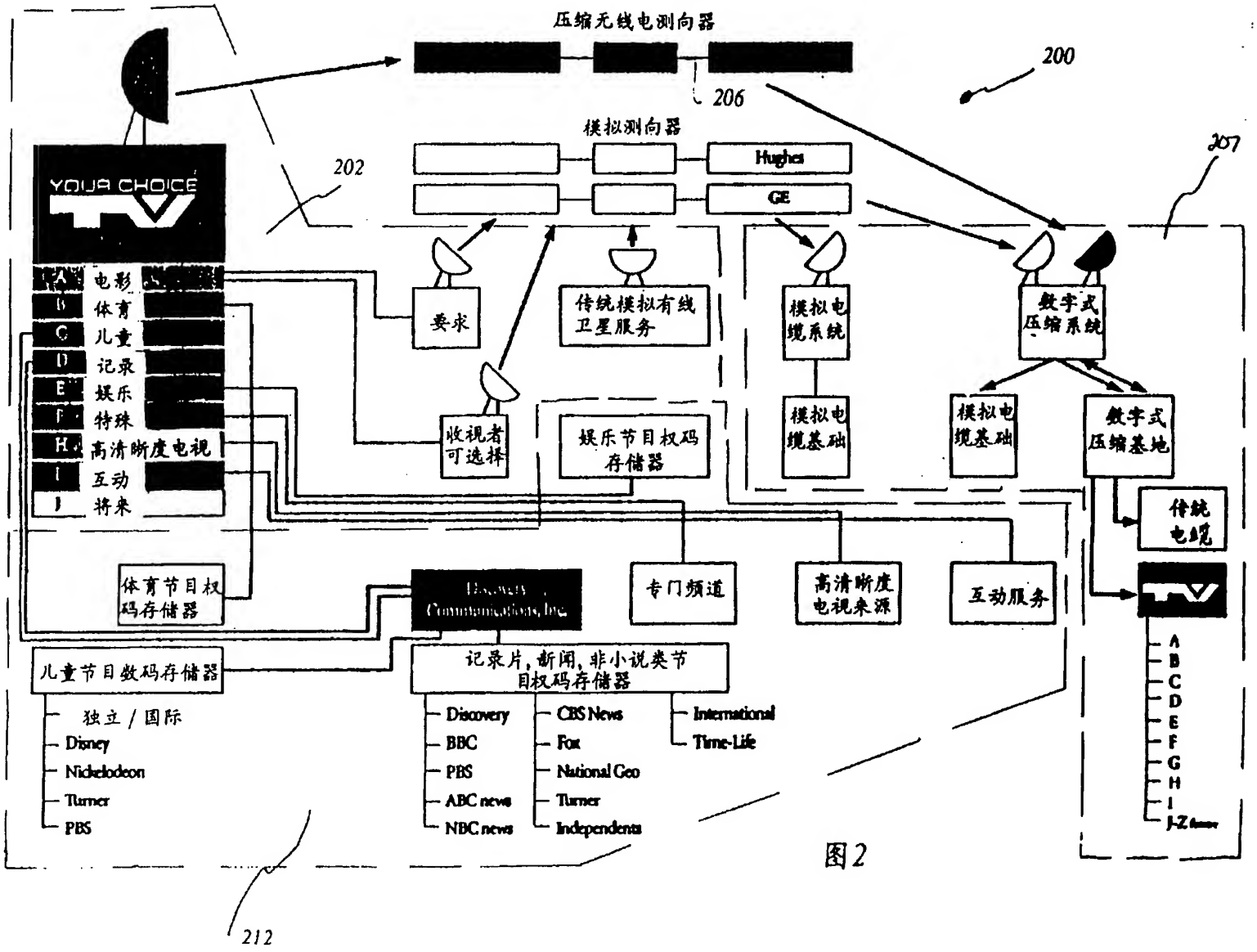

压缩无线电测向器
200
206
模拟测向器
Hughes
GE
207
202
YOUR CHOICE TV
A 电影
B 体育
C 儿童
D 记录
E 娱乐
F 特殊
H 高清晰度电视
I 互动
J 将来
要求
传统模拟有线卫星服务
模拟电缆系统
数字式压缩系统
收视者可选择
娱乐节目权码存储器
模拟电缆基础
数字式压缩基地
传统电缆
体育节目权码存储器
专门频道
高清晰度电视来源
互动服务
儿童节目数码存储器
记录片，新闻，非小说类节目权码存储器
独立 / 国际
Disney
Nickelodeon
Turner
PBS
Discovery
BBC
PBS
ABC news
NBC news
CBS News
Fox
National Geo
Turner
Independents
International
Time-Life
A B C D E F G H I J-Z
212

图2

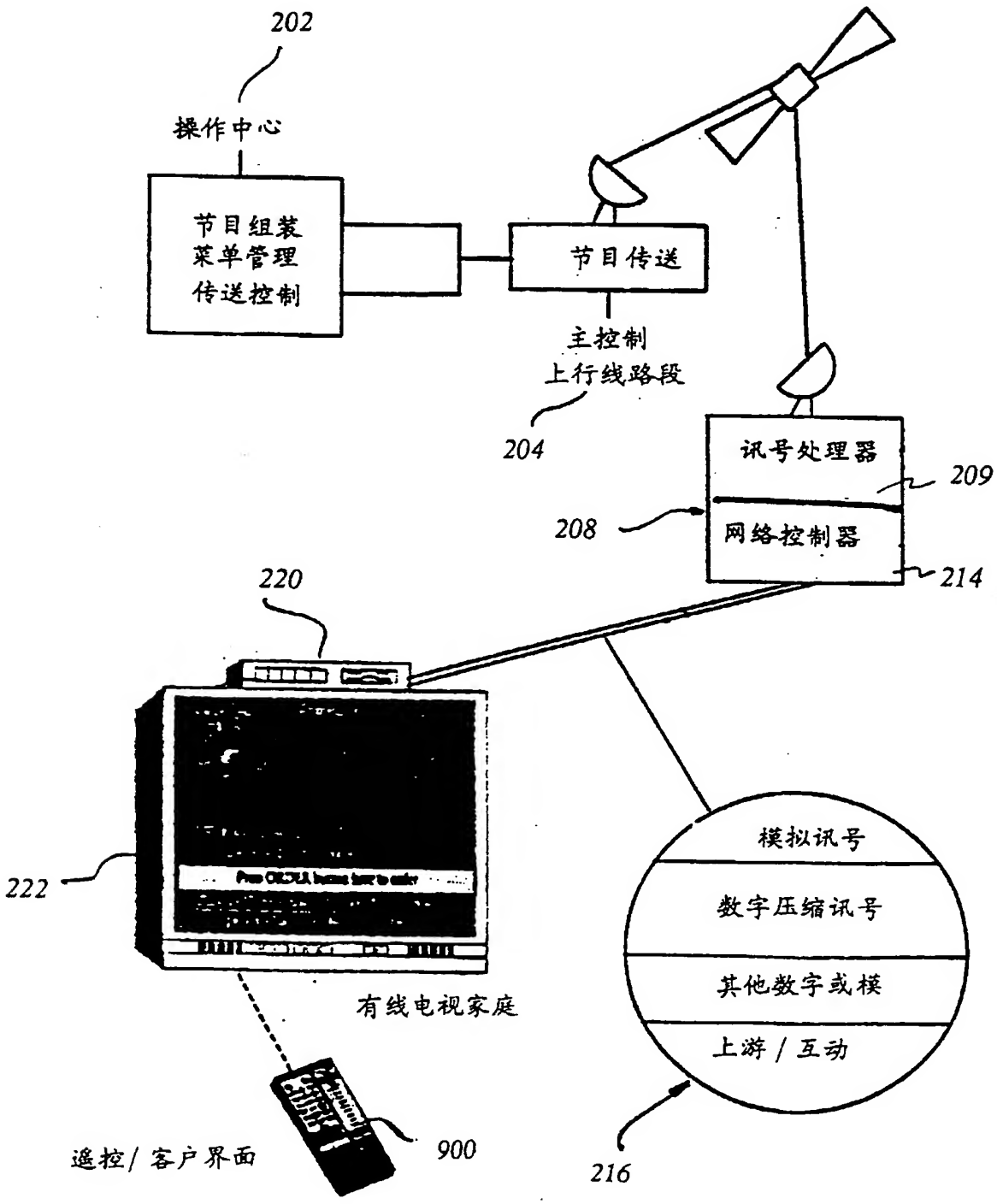

202
操作中心
节目组装
菜单管理
传送控制
节目传送
主控制
上行线路段
204
讯号处理器
209
208
网络控制器
214
220
222
有线电视家庭
模拟讯号
数字压缩讯号
其他数字或模
上游 / 互动
遥控/ 客户界面
900
216

图3

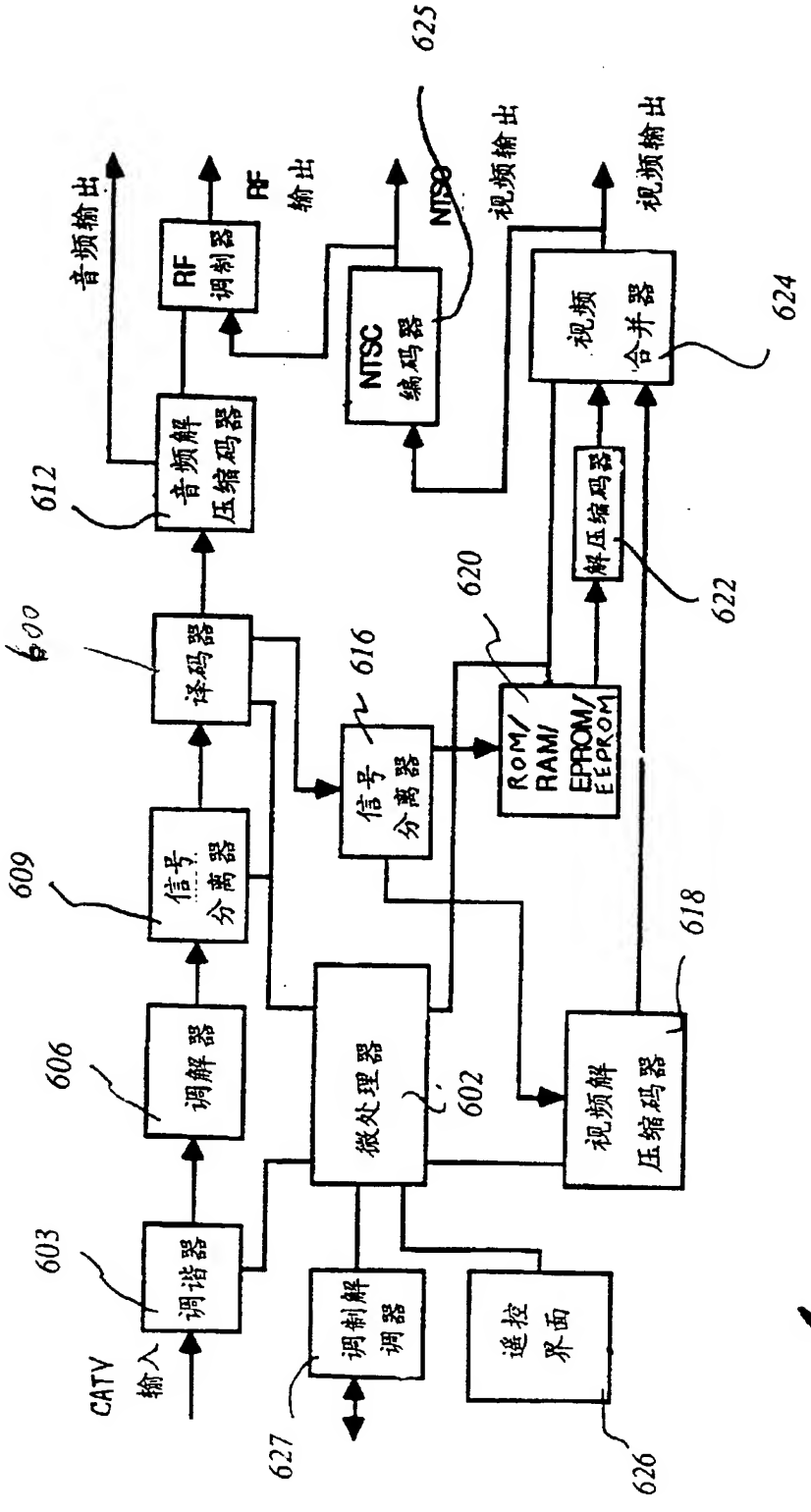

CATV
输入
603
调谐器
606
调解器
609
信号
分离器
600
译码器
612
音频解
压缩码器
音频输出
RF
调制器
RF
输出
625
NTSC
编码器
NTSC
视频输出
视频输出
视频
合并器
624
解压缩码器
622
620
ROM/
RAM/
EPROM/
EEPROM
616
信号
分离器
微处理器
602
618
视频解
压缩码器
调制解
调器
627
遥控
界面
626
220

图4

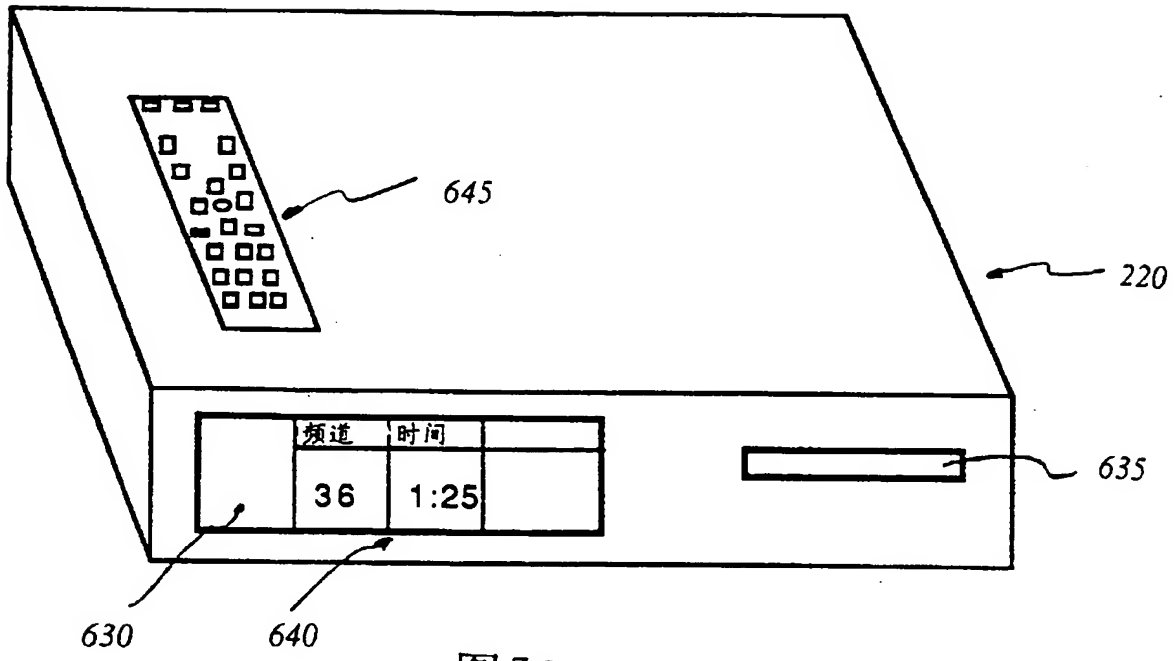

645
220
频道
时间
36
1:25
635
630
640

图5a

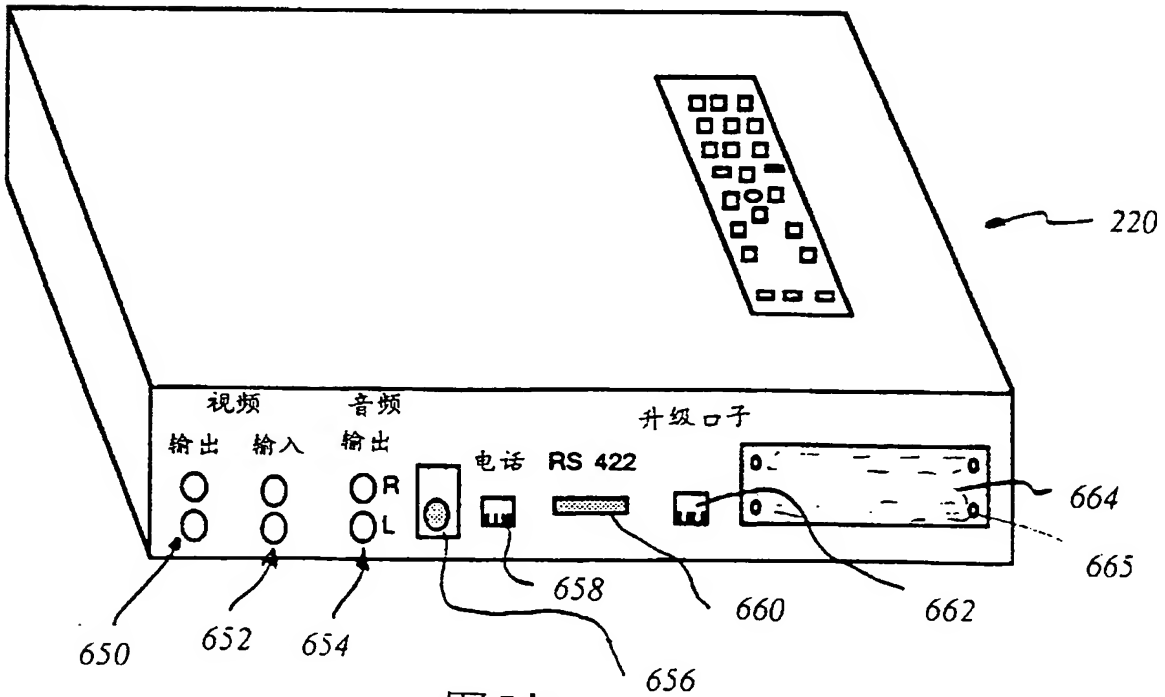

220
视频
音频
输出
输入
输出
R
L
电话
RS 422
升级口子
664
665
650
652
654
658
660
662
656

图5b

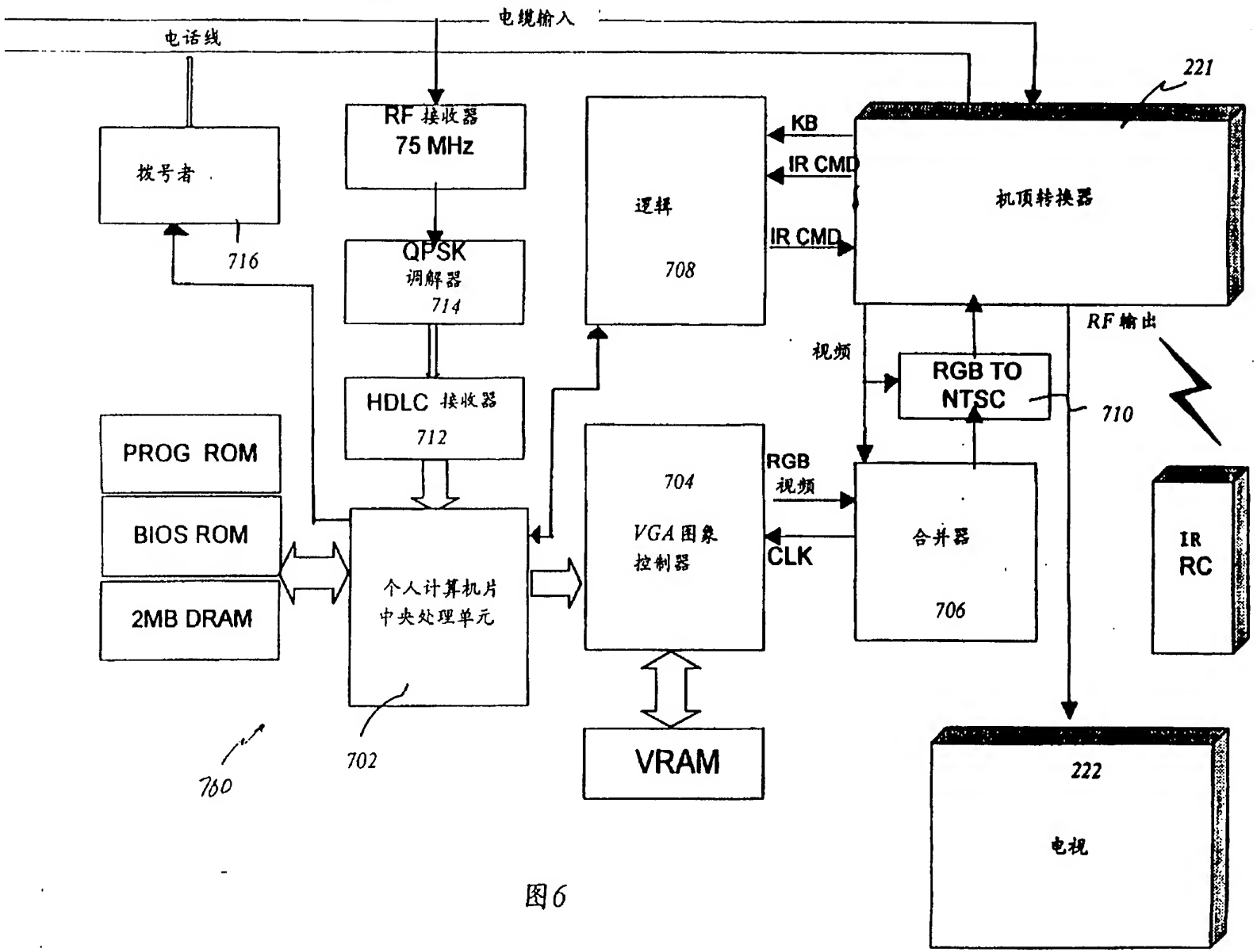

电缆输入
电话线
221
RF 接收器
75 MHz
拨号者
716
QPSK
调解器
714
HDLC 接收器
712
逻辑
708
KB
IR CMD
IR CMD
机顶转换器
RF 输出
视频
RGB TO
NTSC
710
PROG ROM
BIOS ROM
2MB DRAM
个人计算机片
中央处理单元
704
VGA 图象
控制器
RGB
视频
CLK
合并器
706
IR
RC
VRAM
222
电视
700
702

图6

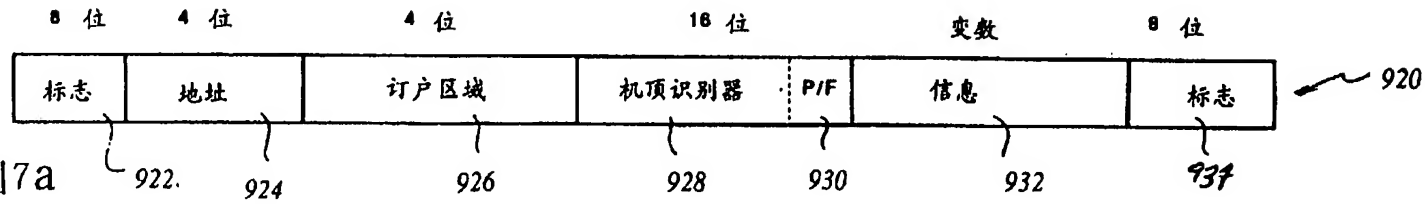
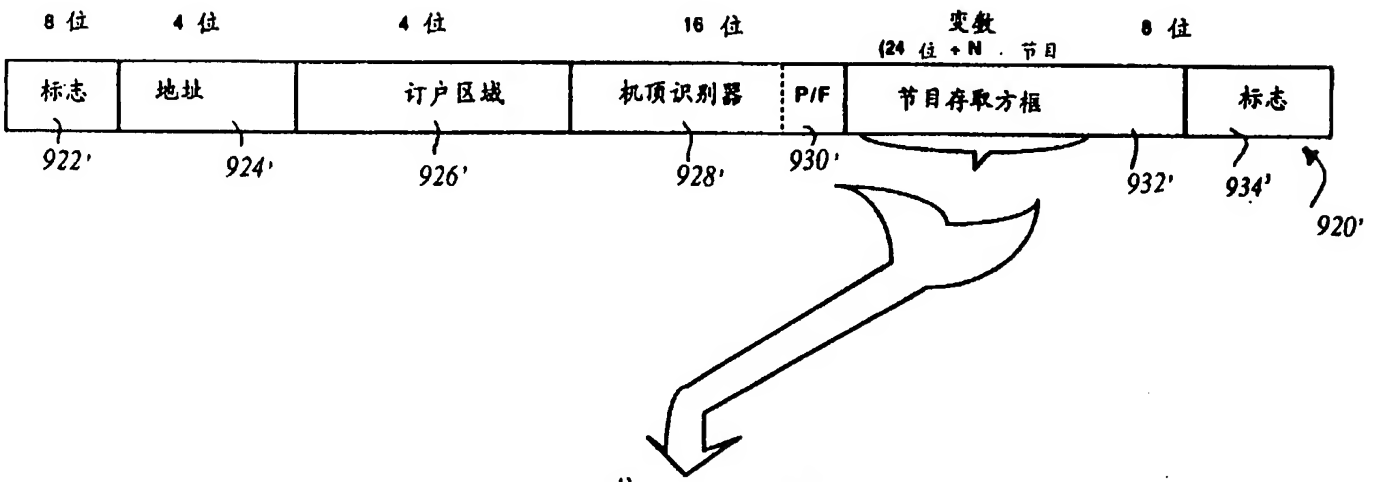

8 位
4 位
4 位
16 位
变数
8 位
标志
地址
订户区域
机顶识别器
P/F
信息
标志
920
922
924
926
928
930
932
934

图7a


8 位
4 位
4 位
16 位
变数
(24 位 + N · 节目
8 位
标志
地址
订户区域
机顶识别器
P/F
节目存取方框
标志
922'
924'
926'
928'
930'
932'
934'
920'

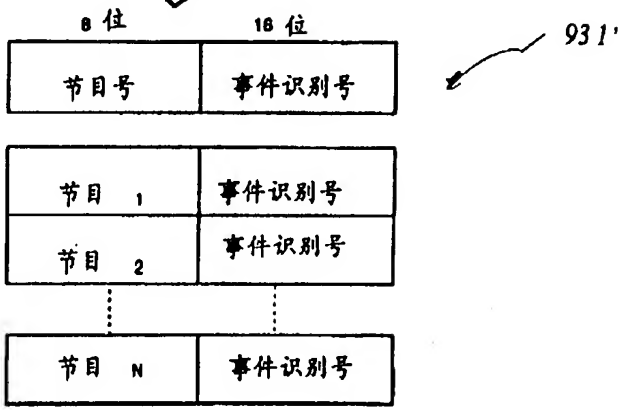

8 位
16 位
931'
节目号
事件识别号
节目 1
事件识别号
节目 2
事件识别号
节目 N
事件识别号

图7b

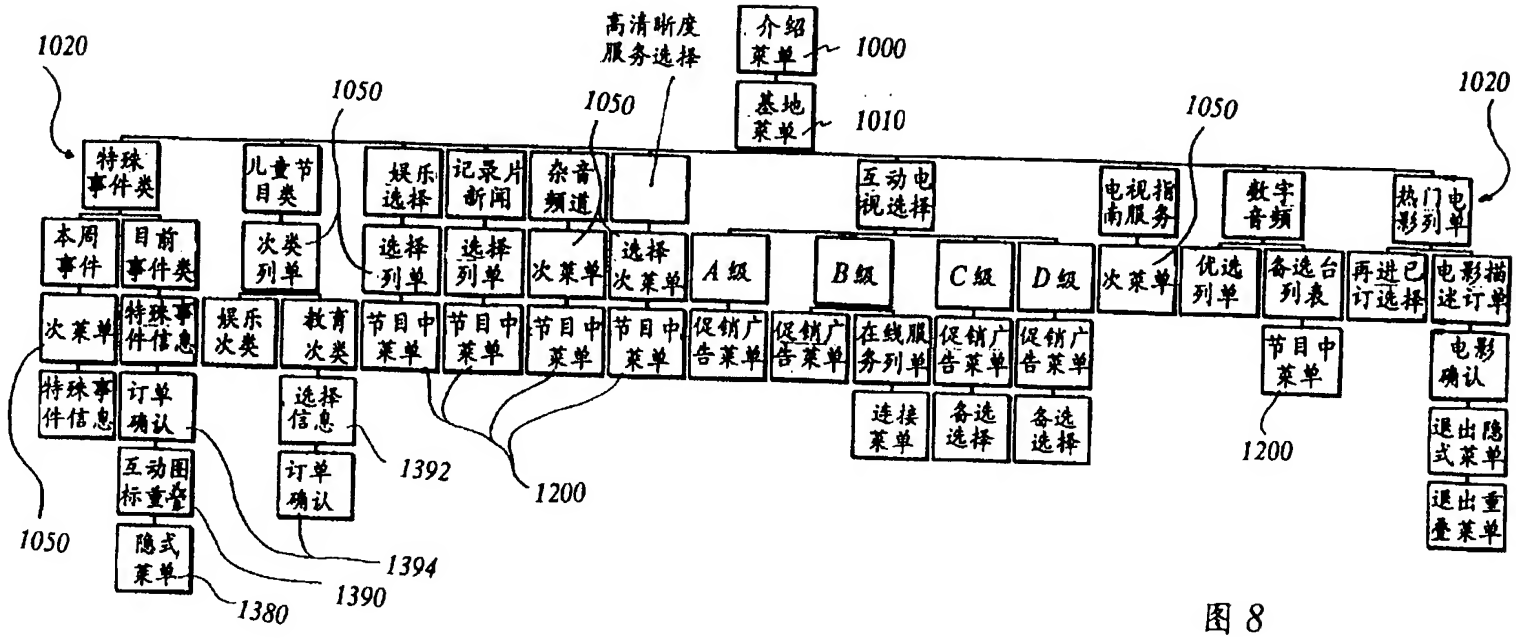

介绍菜单
1000
基地菜单
1010
高清晰度服务选择
1020
1050
特殊事件类
儿童节目类
娱乐选择
记录片新闻
杂音频道
互动电视选择
电视指南服务
数字音频
热门列单
本周事件
目前事件类
次类列单
选择列单
选择列单
次菜单
选择次菜单
A级
B级
C级
D级
次菜单
优选列单
备选台列表
已选再订
电影描述订单
次菜单
特殊事件信息
娱乐次类
教育次类
节目中菜单
节目中菜单
节目中菜单
节目中菜单
促销广告菜单
促销广告菜单
在线服务列单
促销广告菜单
促销广告菜单
节目中菜单
电影确认
特殊事件信息
订单确认
选择信息
退出隐式菜单
互动图标重叠
订单确认
连接菜单
备选选择
备选选择
隐式菜单
退出重叠菜单
1050
1392
1200
1200
1394
1390
1380

图 8

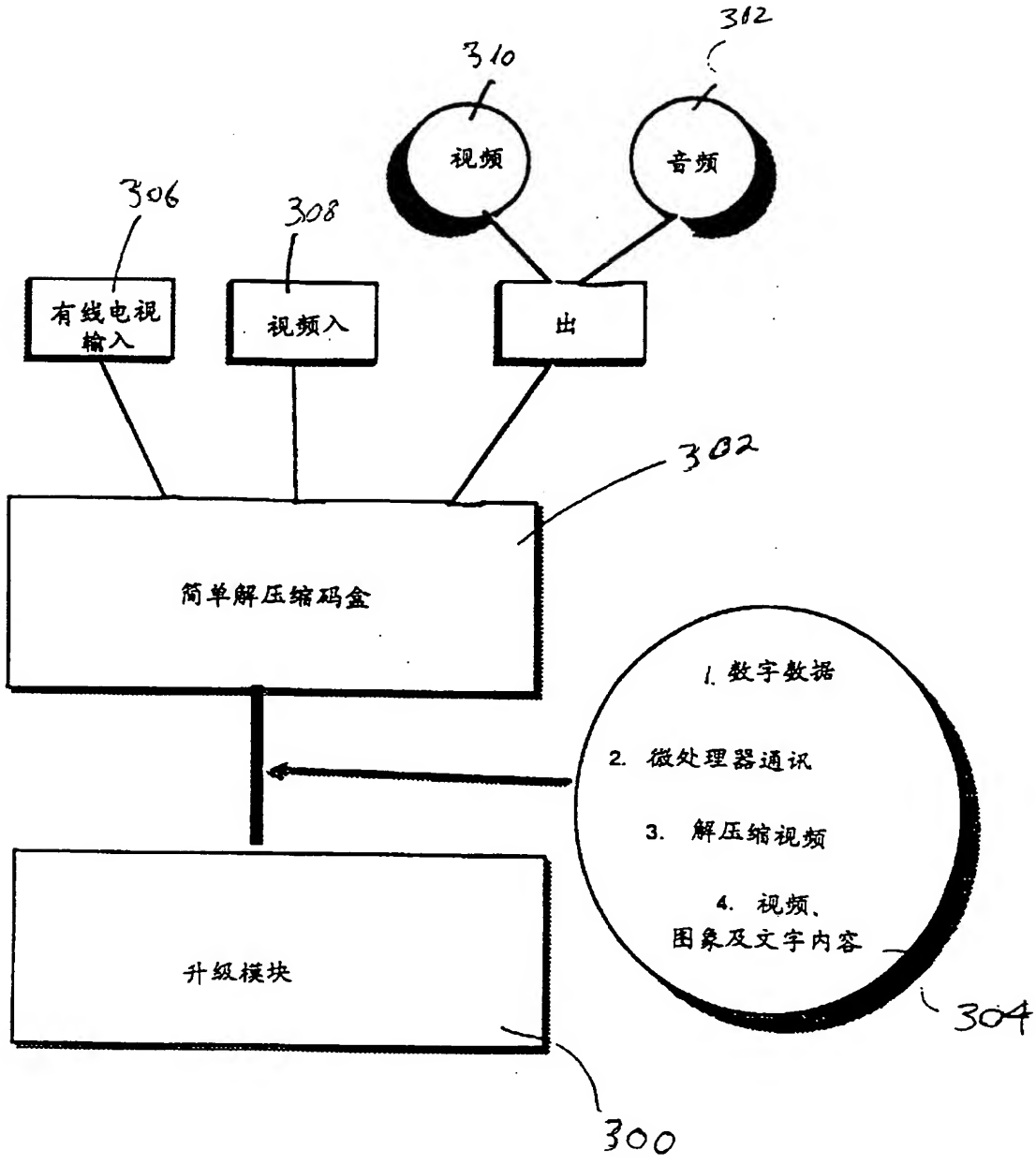

312
310
视频
音频
306
308
有线电视输入
视频入
出
302
简单解压缩码盒
1. 数字数据
2. 微处理器通讯
3. 解压缩视频
4. 视频、图象及文字内容
304
升级模块
300

图9 a

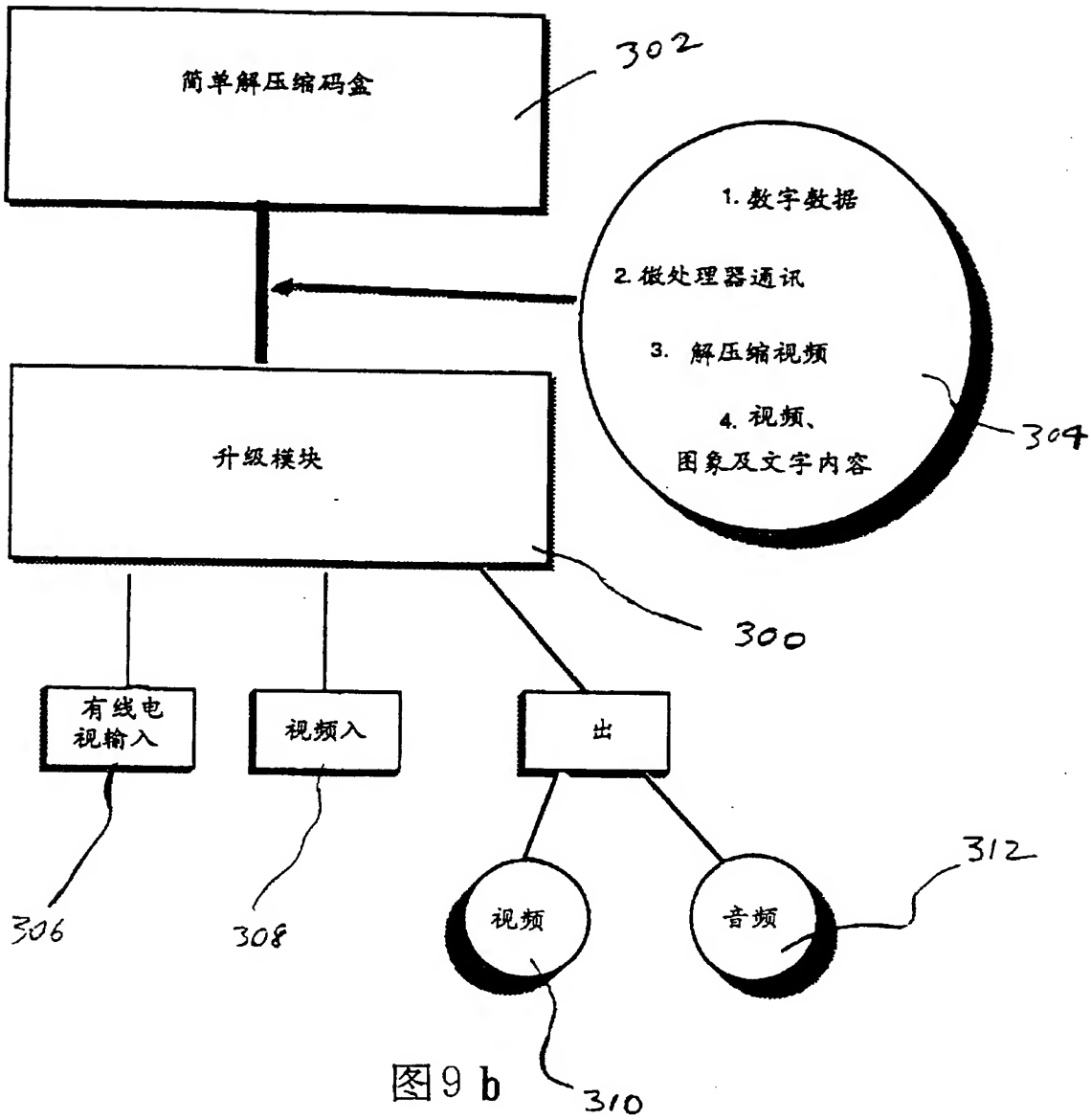

简单解压缩码盒
302
1. 数字数据
2. 微处理器通讯
3. 解压缩视频
4. 视频、
图象及文字内容
304
升级模块
300
有线电
视输入
视频入
出
306
308
视频
音频
312
310

图9 b

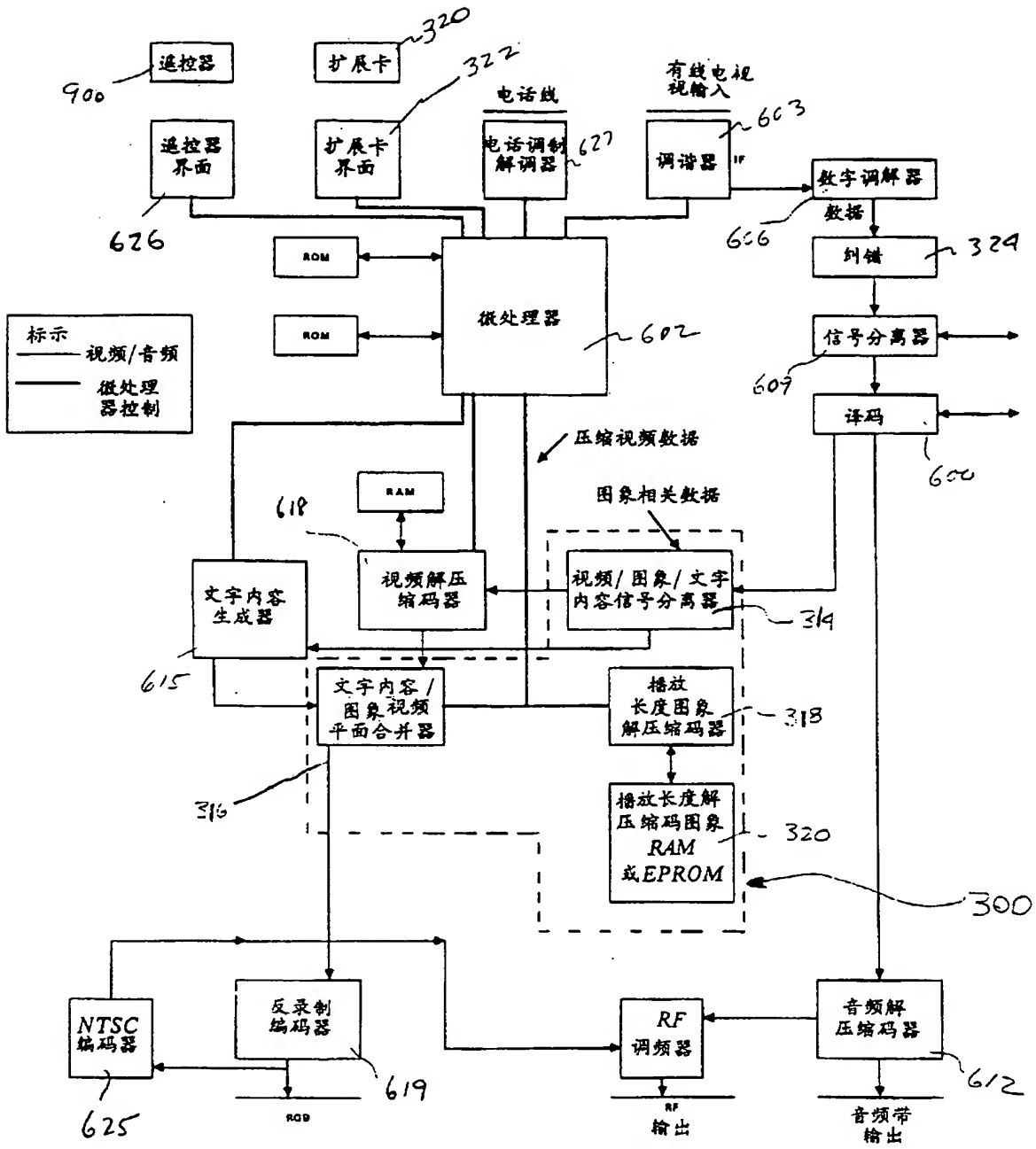
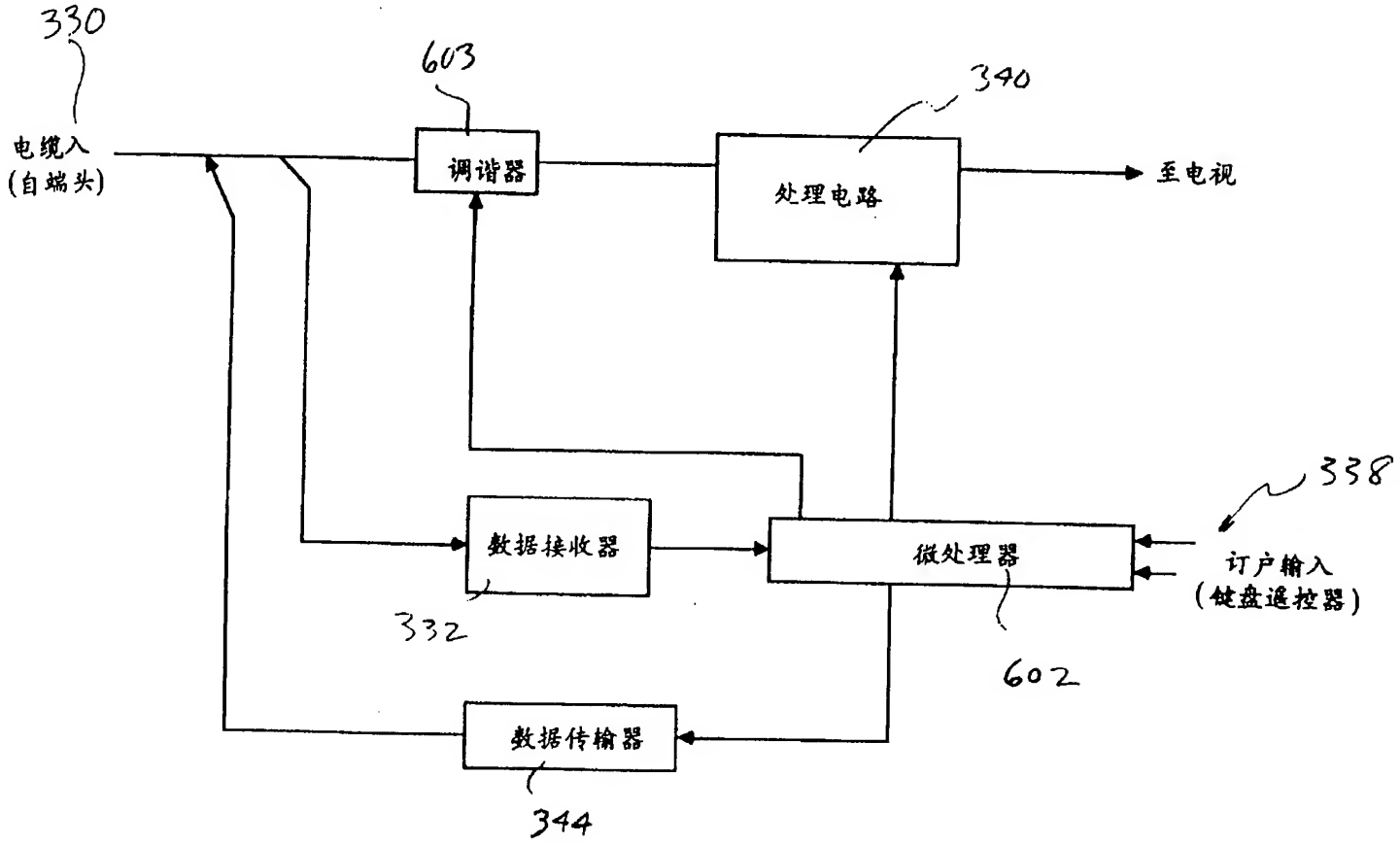

遥控器
900
扩展卡
320
322
电话线
有线电视输入
遥控器界面
扩展卡界面
电话调制解调器
627
调谐器
603
IF
数字调解器
数据
606
626
ROM
ROM
微处理器
602
纠错
324
信号分离器
609
译码
600
标示
视频/音频
微处理器控制
压缩视频数据
RAM
618
图象相关数据
视频解压缩码器
视频/图象/文字内容信号分离器
314
文字内容生成器
615
文字内容/图象视频平面合并器
播放长度图象解压缩码器
318
316
播放长度解压缩码图象RAM或EPROM
320
300
NTSC编码器
625
反录制编码器
619
RGB
RF调频器
RF输出
音频解压缩码器
612
音频带输出

图10



机顶终端上游数据传输硬件

图11

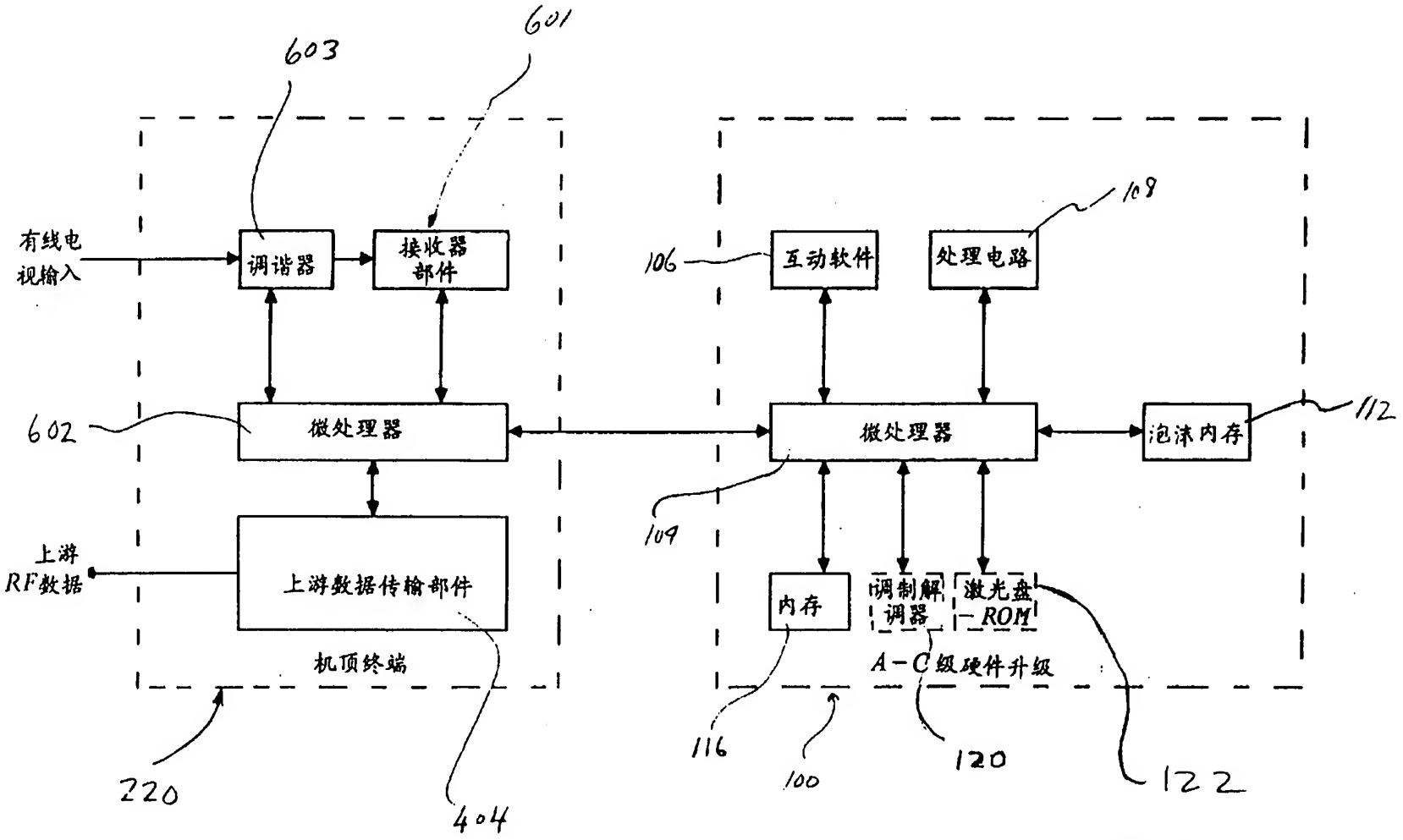

603
601
有线电视输入
调谐器
接收器部件
602
微处理器
上游RF数据
上游数据传输部件
机顶终端
220
404
106
互动软件
108
处理电路
微处理器
109
泡沫内存
112
内存
调制解调器
激光盘-ROM
A-C级硬件升级
116
100
120
122

图12a

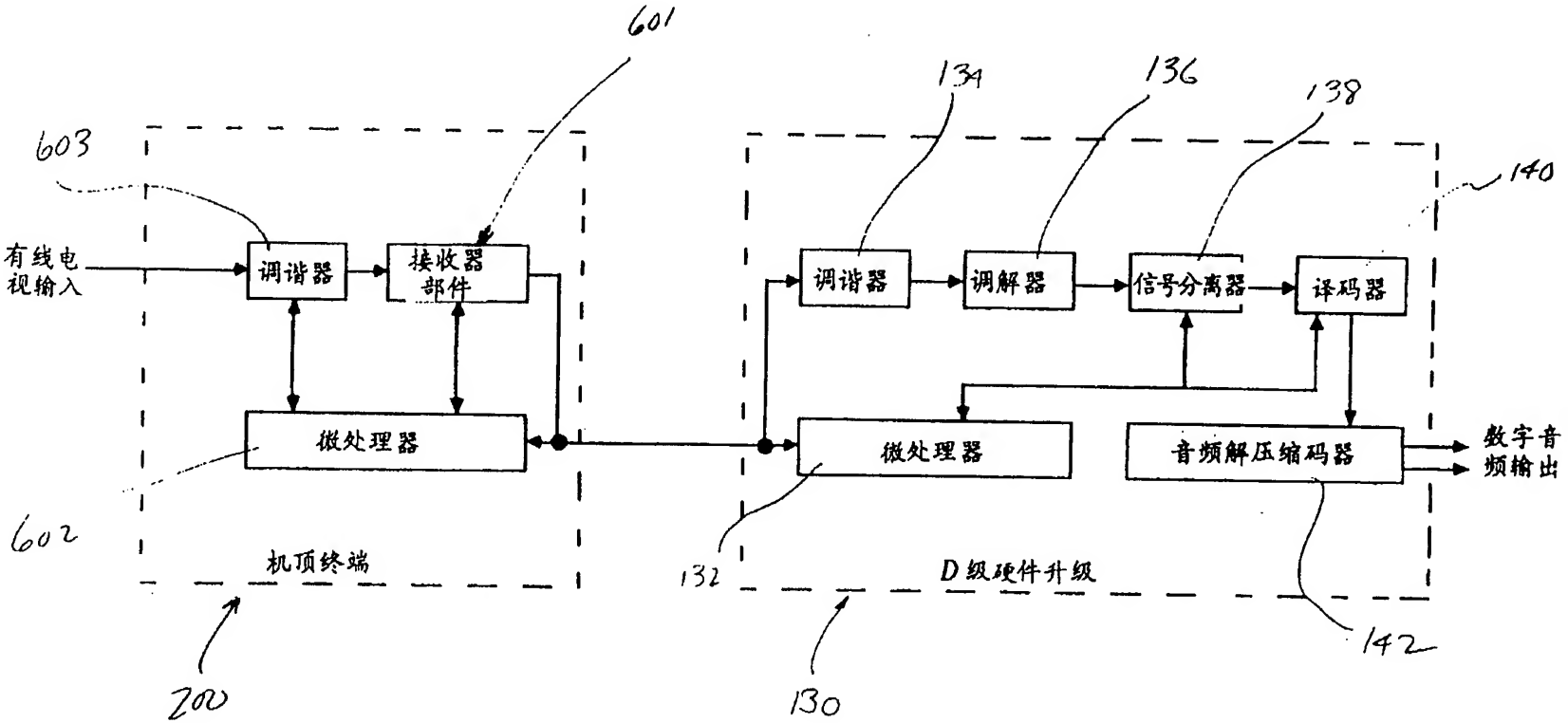

601
603
134
136
138
140
有线电
视输入
调谐器
接收器
部件
调谐器
调解器
信号分离器
译码器
微处理器
微处理器
音频解压缩码器
数字音
频输出
602
机顶终端
132
D级硬件升级
142
200
130

图12 b

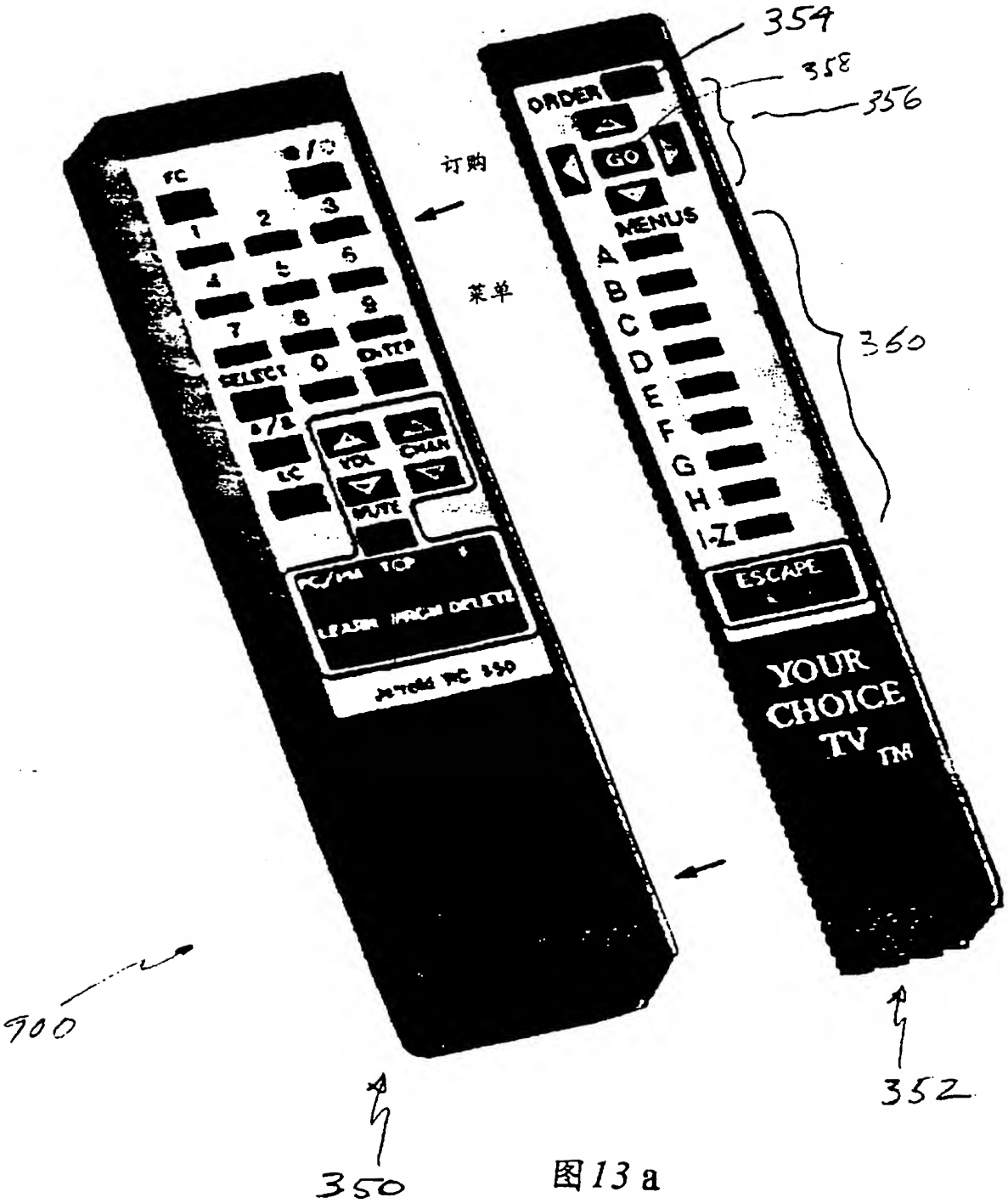

354
358
356
ORDER
GO
MENUS
A
B
C
D
E
F
G
H
I-Z
360
ESCAPE
YOUR CHOICE TV TM
352
订购
菜单
900
350

图13a

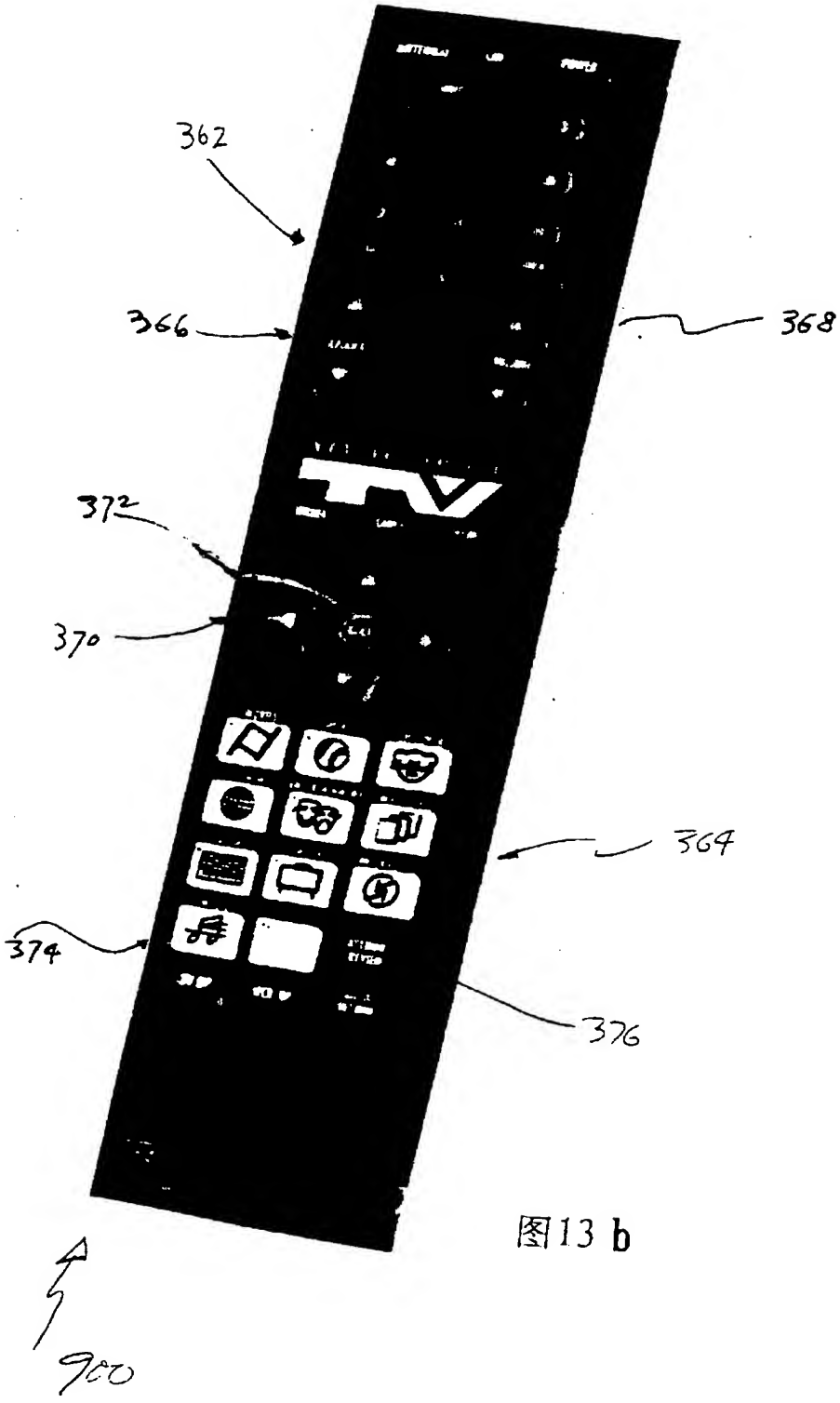


图13 b

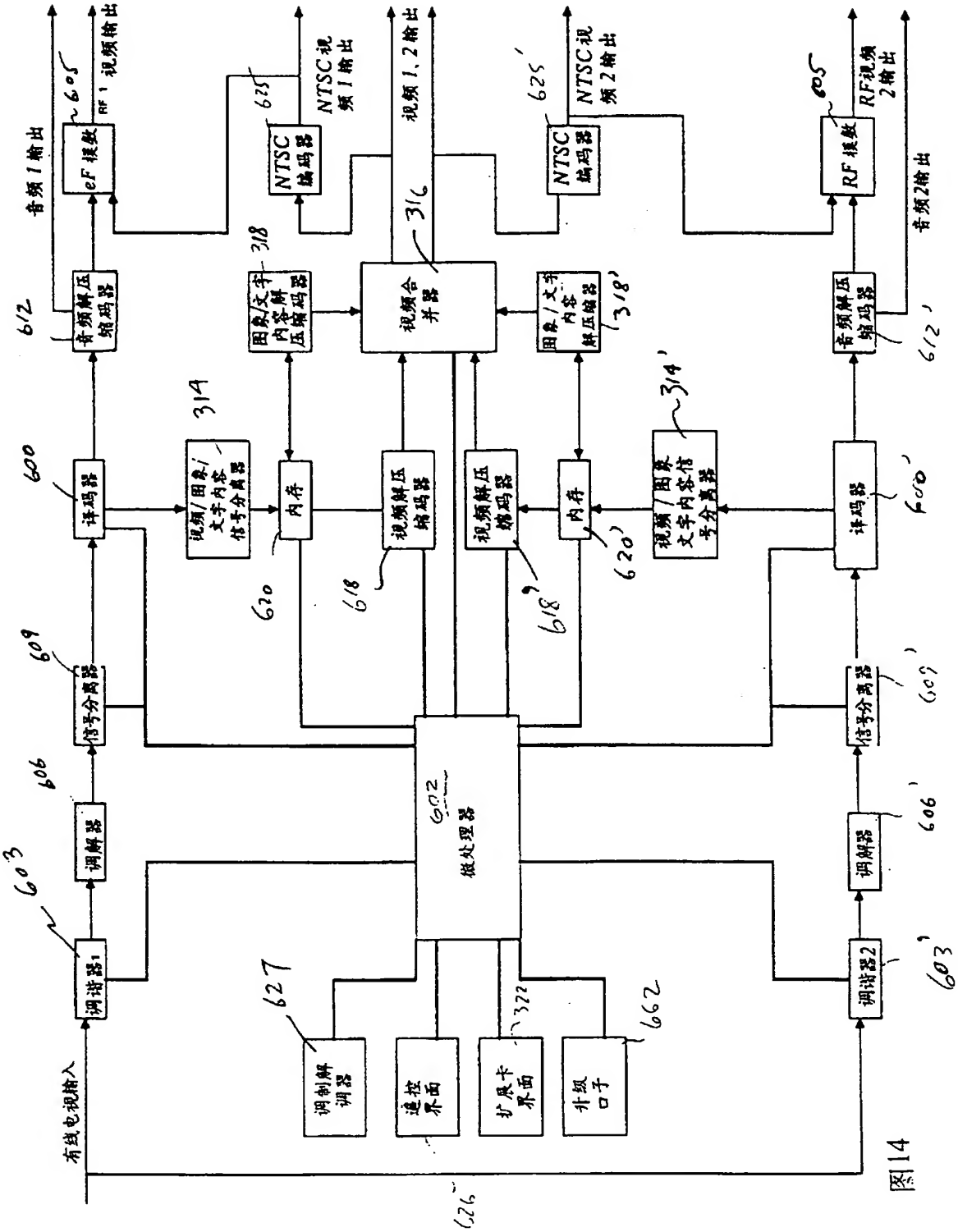
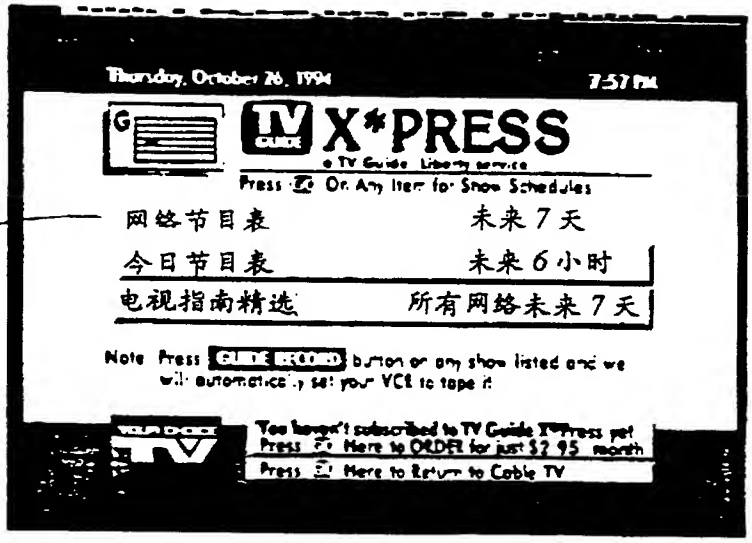

有线电视输入
调谐器1
调解器
信号分离器
译码器
音频解压缩码器
RF 模数
音频1输出
RF 视频输出
视频/图象/文字内容信号分离器
内存
视频解压缩码器
图象/文字内容解压缩码器
视频合并器
NTSC编码器
NTSC视频1输出
视频1、2输出
NTSC编码器
NTSC视频2输出
RF 模数
RF视频2输出
音频2输出
视频/图象/文字内容信号分离器
内存
视频解压缩码器
图象/文字内容解压缩码器
译码器
音频解压缩码器
信号分离器
调解器
调谐器2
微处理器
调制解调器
遥控界面
扩展卡界面
升级口子

图14

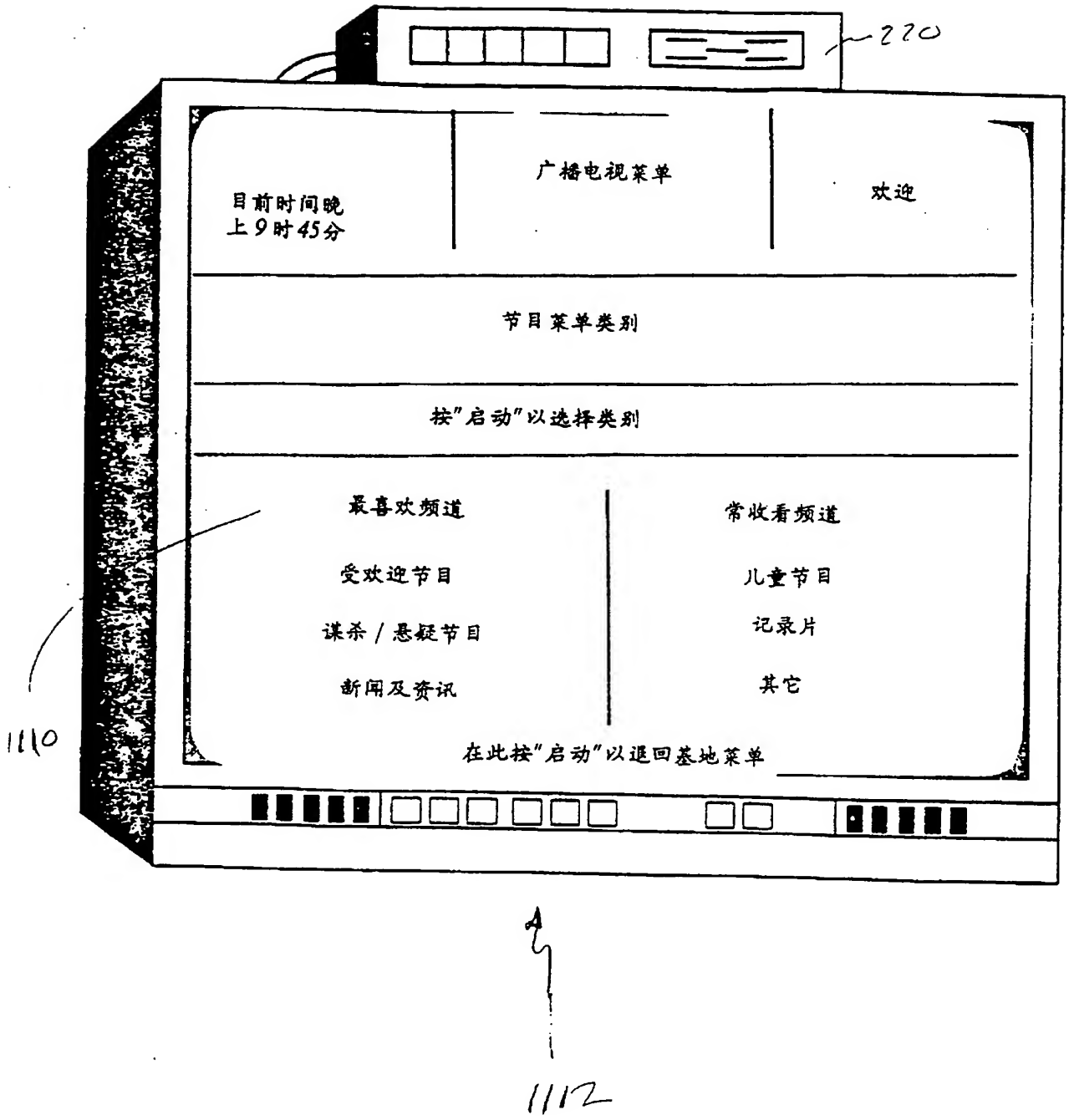
图15



1102

1100

图16a


220
目前时间晚
上9时45分
广播电视菜单
欢迎
节目菜单类别
按"启动"以选择类别
最喜欢频道
常收看频道
受欢迎节目
儿童节目
谋杀/悬疑节目
记录片
新闻及资讯
其它
在此按"启动"以退回基地菜单
1110
1112

情调问题菜单

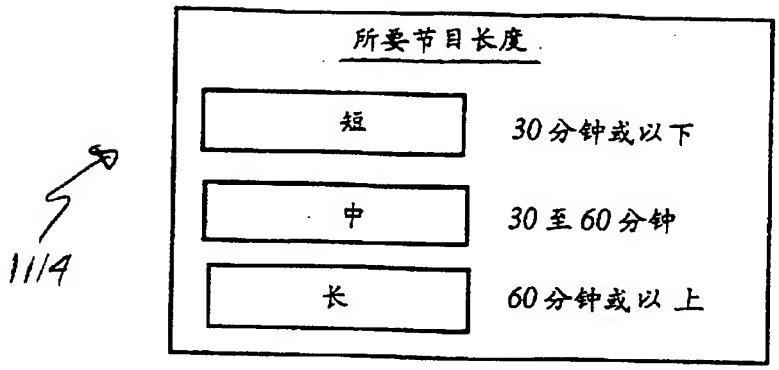


图16b

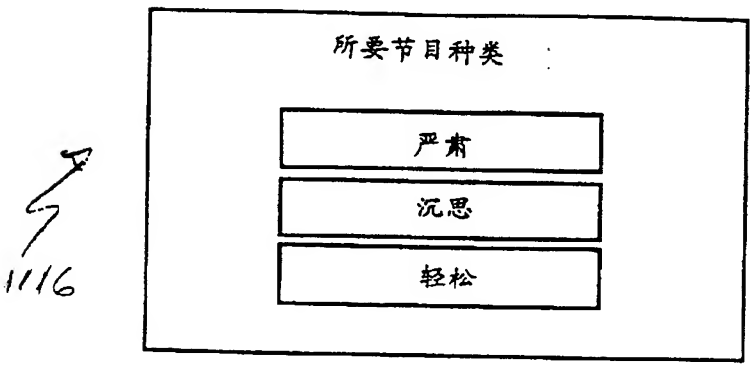


图16c

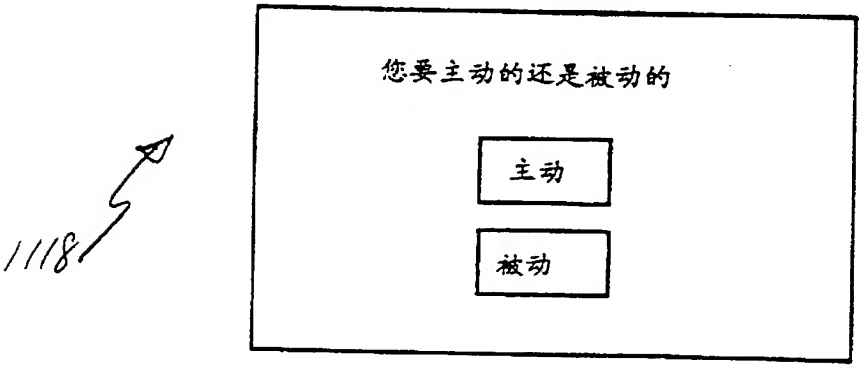


图16 d

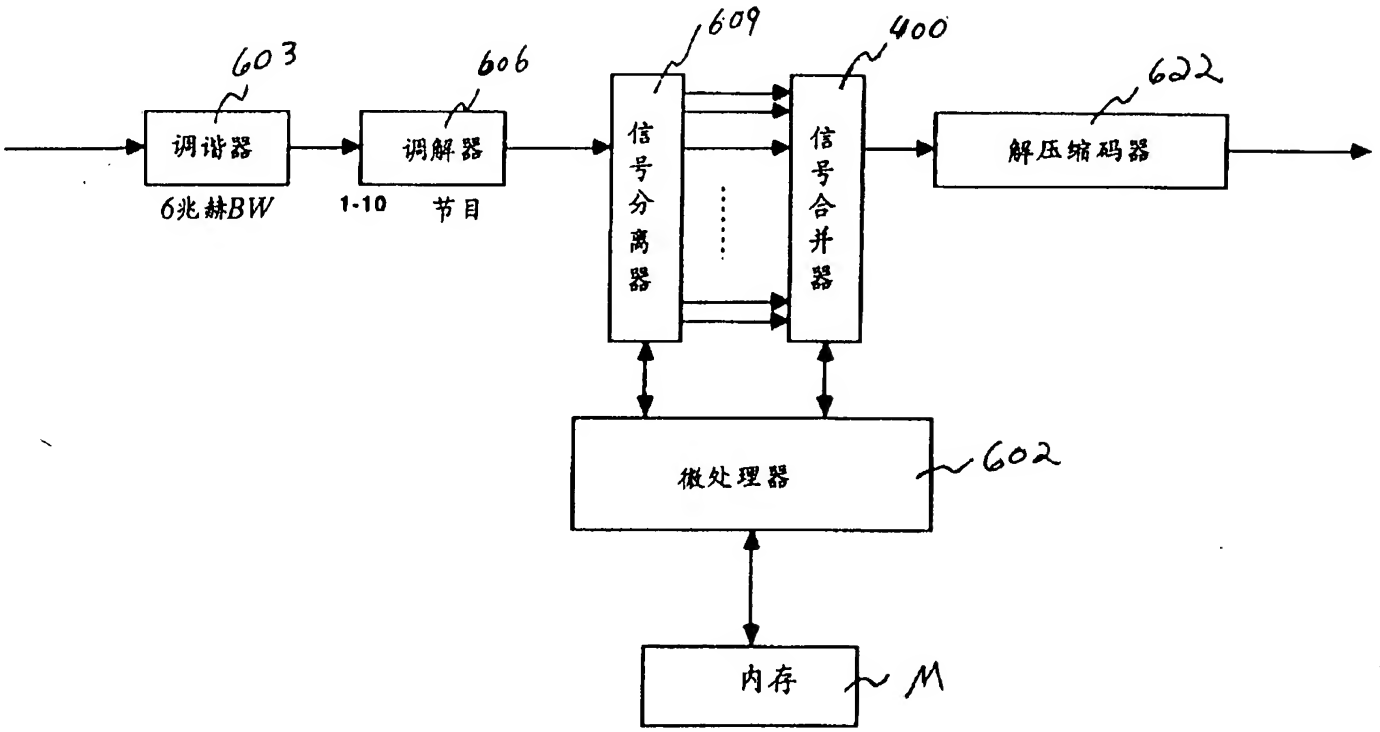


图17a

STT 频道转换硬件：频道转换于6兆赫带宽之间

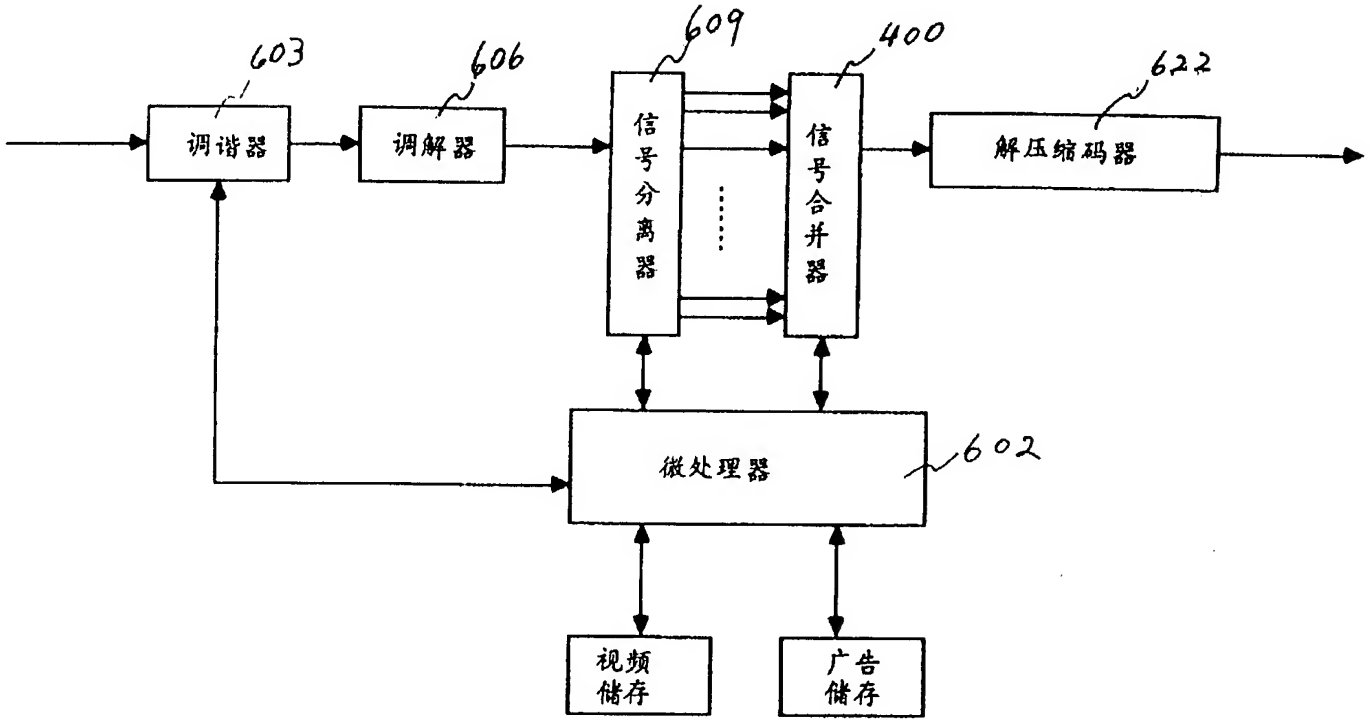


图17 b

STT 频道转换硬件：频道转换于6兆赫带宽以外

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